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December, 1950

EDISON ELECTRIC INSTITUTE BULLETIN

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PUBLISHED MONTHLY BY EDISON ELECTRIC INSTITUTE

ELECTRICAL RESEARCH STATISTICS
THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

August, 1949-1950

SOURCE AND DISPOSAL OF ENERGY—MONTH OF AUGUST

	1950	1949	%
GENERATION* (Net)			
By Fuel Burning Plants	21,337,887,000	17,691,556,000	+20.6
By Water Power Plants	7,531,379,000	7,336,048,000	+ 2.7
Total Generation	**28,869,266,000**	**25,027,604,000**	**+15.3**
Add—Net Imports Over International Boundaries	94,055,000	85,005,000	+10.6
Less—Company Use	113,014,000	117,137,000	− 3.5
Less—Energy Used by Producer	846,378,000	506,502,000	+67.1
Net Energy for Distribution	**28,003,929,000**	**24,488,970,000**	**+14.4**
Losses and Unaccounted for	4,357,823,000	3,730,566,000	+16.8
Sales to Ultimate Customers	**23,646,106,000**	**20,758,404,000**	**+13.9**

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS—As of August 31st			
Residential or Domestic	36,859,069	34,736,576	+ 6.1
Rural (Distinct Rural Rates)	1,587,990	1,769,378	−10.3**
Commercial or Industrial:			
Small Light and Power	5,449,522	5,251,649	+ 3.8
Large Light and Power	234,163	229,993	+ 1.8
Other Customers	152,946	144,910	+ 5.5
Total Ultimate Customers	**44,283,690**	**42,132,506**	**+ 5.1**
KILOWATTHOUR SALES—During Month of August			
Residential or Domestic	4,963,508,000	4,421,932,000	+12.2
Rural (Distinct Rural Rates)	867,380,000	873,038,000	− 0.6
Commercial or Industrial:			
Small Light and Power	4,340,414,000	4,032,982,000	+ 7.6
Large Light and Power	12,171,743,000	10,119,566,000	+20.3
Street and Highway Lighting	218,256,000	202,074,000	+ 8.0
Other Public Authorities	586,605,000	592,287,000	− 1.0
Railways and Railroads:			
Street and Interurban Railways	264,708,000	285,204,000	− 7.2
Electrified Steam Railroads	187,990,000	184,926,000	+ 1.7
Interdepartmental	45,502,000	46,395,000	− 1.9
Total to Ultimate Customers	**23,646,106,000**	**20,758,404,000**	**+13.9**
Revenue from Ultimate Customers	**$421,089,900**	**$382,148,600**	**+10.2**

RESIDENTIAL OR DOMESTIC SERVICE

AVERAGE CUSTOMER DATA—For 12 months ended August 31st			
Kilowatthours per Customer	1,780	1,645	+ 8.2
Average Annual Bill	$51.80	$48.86	+ 6.0
Revenue per Kilowatthour	2.91¢	2.97¢	− 2.0

* By Courtesy of the Federal Power Commission.
** Negative Percentage due to Reclassification.

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EDISON ELECTRIC INSTITUTE BULLETIN

Volume 18 DECEMBER, 1950 No. 12

The Electric Industry In 1950

By Louis V. Sutton

President, Carolina Power & Light Company
and
President, Edison Electric Institute

TAKING the shift to a partially mobilized economy in stride, the nation's electric light and power industry in 1950 demonstrated its ability to provide electricity for both defense and civilian needs, and at the same time registered impressive gains in electric generating capability, power production, sales and customers.

Major Gains in 1950

A major gain recorded in 1950 was the installation of 6.7 million kilowatts of new generating capability. The electric companies' expansion program, begun at the close of World War II, continued in high gear; and the companies stepped up the tempo of capacity additions as well as placing large orders for equipment deliveries to maintain the existing high rate of generating capacity installation over three or four years ahead.

Power generation moved sharply up during the year, reaching a new high for the electric industry of 328 billion kilowatthours, nearly 12 per cent greater than the previous record output of 1949. The addition of 58 billion kilowatthours generated by industrial and railway plants for their own use brought electricity production by all sources in the U. S. to a total of 386 billion kilowatthours for 1950.

Industry Ready for National Emergency

The progress made in 1950 indicates the strength of the electric industry and gives firm backing to the conviction that in a national emergency the industry can match its record of service to the country in World War II, when there was plenty of power for every need, whether military or civilian. The industry's kilowatthour generation in 1950 was twice that of 1941; kilowatts of reserve generating capability were about equal to the reserves at the time of Pearl Harbor; and important improvements have been made during and since World War II in operating efficiency, power pooling and interconnection of electric systems.

The business-managed electric companies, with 85 per cent of all electricity sales, have by far the greatest responsibility for electricity supply. Since the end of World War II, the companies have been engaged in a $15 billion expansion program, unequaled in the history of any industry, which is expected to add more than 31 million kilowatts of generating capability by the end of 1953. This expansion is now half completed, and the successful attainment of the projected 1953 goal is contingent on there being no interference with manufacturers' schedules.

Interference With Manufacturers' Schedules

Such interference could have serious effect on the power supply situation. Alteration of these schedules could not increase the amount of electric generating capability to be installed in the next two years. It *would* upset power supply plans carefully made by the utility systems to suit the needs of their areas.

Also it must be emphasized that if equipment intended for the nation's electric systems should be diverted to other purposes, our predictions and expectations would, of course, be without the foundation which careful planning, ordering, and scheduling have provided.

Assuming that construction is allowed to proceed as planned, the electric companies will have over 75 million kilowatts of generating capability at the end of 1953, more than twice the figure at the beginning of 1941. For the industry as a whole, the 1953 total will be 93½ million kilowatts.

Increases in Reserve Margins

Under the projected expansion, reserve margins of generating capability are expected to show successive increases, reaching 14½ per cent of the year's peak in 1951; 18 per cent in 1952; and 20 per cent in 1953. The calculations of load growth on which these reserve margins are based do not include large individual defense production plans on which no definite information is available at this time. As such large individual requirements appear, there will probably be some drawing upon these reserves and, in addition, special provisions for installation of power facilities will be necessary.

It is of course important that the locations of any such heavy defense loads be established with due regard to available power reserves.

New Customers Total Two Million in 1950

How well the electric industry is serving the people of the nation is indicated in the gains in number of customers and in power use. Some two million new customers came on electric lines in 1950, bringing the total to 45 million, and marking the fifth straight year in which more than 2 million customers have been added, the highest "new customer" rate in industry history. In the homes of America, about 98 per cent of which have service available, electricity

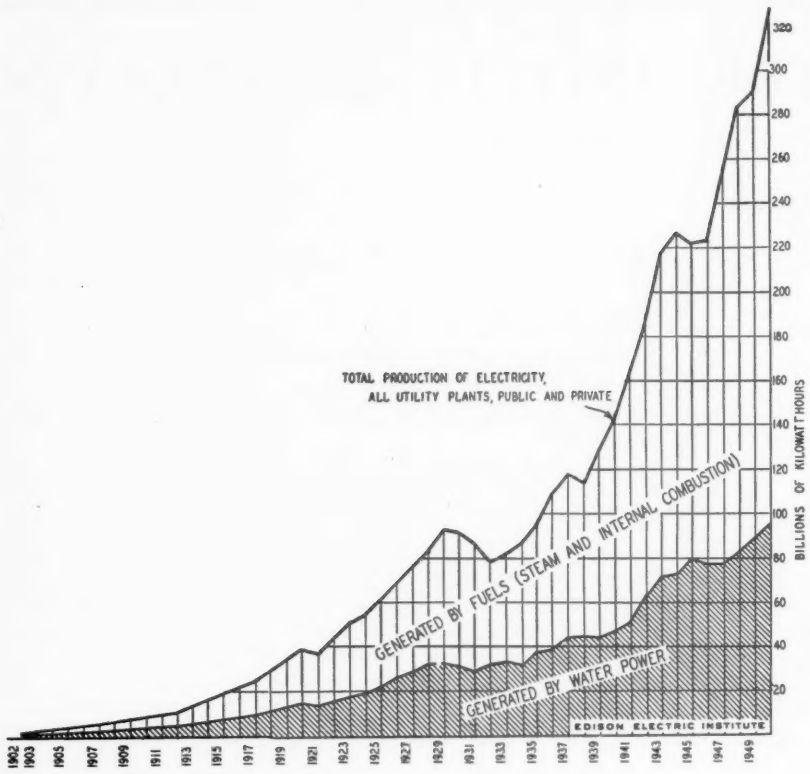

Fig. 1—Total Production of Electricity by Utilities, Showing Kilowatthours Generated by Fuels and by Water Power

use registered its largest annual increase; and average price of electricity to the residential consumer declined to a new low of 2.89 cents per kilowatthour.

Sales At All-Time High

In attaining a new peak of 280 billion kilowatthours in 1950, sales of the electric industry increased 12.6 per cent over the previous record set in 1949. Residential sales were 67 billion kilowatthours, 15 per cent over 1949; and commercial sales totaled 51 billion kilowatthours, for a 10 per cent gain.

Sales to large power users composing the industrial classification comprised 50 per cent of all sales, and showed the greatest gain, 18 billion kilowatthours, or 15 per cent over 1949.

Electricity Use in Home Scores Record Rise

Residential consumers in the United States, who constitute over 80 per cent of the electric industry's customer total, increased their individual annual average use of electricity by 145 kilowatthours in 1950, the highest yearly gain yet recorded. Average consumption by the home customer in 1950 was 1825 kilowatthours, nearly 50 per cent greater than his average use in 1945, only five years earlier.

During this period, the cost of living index jumped over 47 points, but the residential electricity index showed a *decline* of more than 2 points. In 1945, the cost of living index stood at 128.4, while the residential electricity index was 93.1. The 1950 average for the cost of living was 176.0; for residential electricity, the average was 90.5. Average revenue for residential electricity declined 15 per cent from 1945's 3.41 cents per kilowatthour to 2.89 cents in 1950.

Farm Use of Electricity Shows Impressive Gain

With about 93 per cent of the farms in the United States now either taking electric service or having it readily available nearby, and with the task of extending rural distribution lines approaching practical completion, continuing efforts to develop the most effective applications of electricity to agriculture have acquired primary emphasis. Indicative of the progress which has been made in this important field is the growth in electricity consumption by the farm customer, which, in 1950, reached an annual average of 2350 kilowatthours on those farms where irrigation is not a factor. This total includes one of the largest year-to-year gains made in farm use of electricity and is approximately 50 per cent greater than the average of 1571 kilowatthours consumed by the farm customer in 1945.

New Highs in Revenues and Net Income

Along with accomplishments in other phases of electrical operation, advances were recorded in revenues, net income and dividends during 1950. Gross revenues of the electric companies increased by some $365 million over 1949, an increase of 9 per cent, and totaled $4,475 million for the year. But due to increased expenses, principally taxes, net income in 1950 did not show a commensurate gain, although it did reach $820 million, a new high, in an increase over 1949 of $55 million, or 7 per cent. This estimate, however, does not include the possible effects of any retroactive excess profits tax legislation that may be enacted. Dividends on common and preferred stock of the electric companies totaled $620 million for 1950.

Investments in New Plant and Equipment

During the year, more than $2 billion was spent by the electric companies on new electric plant and equipment, bringing the total plant investment, including that devoted to gas in the so-called "combination companies," to $21.5 billion, an increase of almost 10 per cent over the 1949 total.

Taxes Total One Billion Dollars

For the first time in electric industry history, taxes of over $1 billion were paid by the electric companies, including those with gas departments. For electric operations only, the 1950 tax bill was $937 million, 18 per cent higher than in 1949, and the leading expense item. While this figure includes the higher tax rates which went into effect during the year, it makes no allowance for any retroactive effect if an excess profits tax should be imposed.

Taxes for 1950 amounted to about 21 per cent of electric company gross revenues, as against 19 per cent in 1949. About $550 million went to the support of the Federal government, while state and local governments received the remaining $387 million.

Other Expenses Climb

Participating in the general upward trend, other electric company expenses were also higher. Wages and salaries followed taxes as the second largest expense item in 1950, amounting to $920 million, about $58 million over the figure for 1949, when payrolls were first and taxes were second. The third largest expenditure in 1950 was for fuel, a total of $766 million, $60 million greater than the fuel bill for 1949.

Significant Advances in Industrial Use

In 1950, an all-time high of 139 billion kilowatthours of purchased power was used by American industry and commerce. The number of kilowatthours used per manhour in manufacturing rose to more than 6 from the figure of 4 kilowatthours per manhour during World War II, an increase of 50 per cent. In effect, this development has added the potential output of 1.5 million production workers to the nation's productive capacity over the peak war years of 1943-44.

Cost of Electricity Declines

Also impressive is the growth in the annual average of kilowatthours used per worker in manufacturing, bringing the 1950 average to 14,000 kilowatthours, 60 per cent greater than in 1939.

While electricity has been playing an increasingly important role in manufacturing processes, it has been taking a consistently smaller place in costs of production. In 1939, purchased power cost was 1.41 per cent of the product value for all manufacturing; by the end of 1947, the latest year for which comprehensive data on industrial power are available, the percentage had been reduced almost half to about three-quarters of 1 per cent of product value.

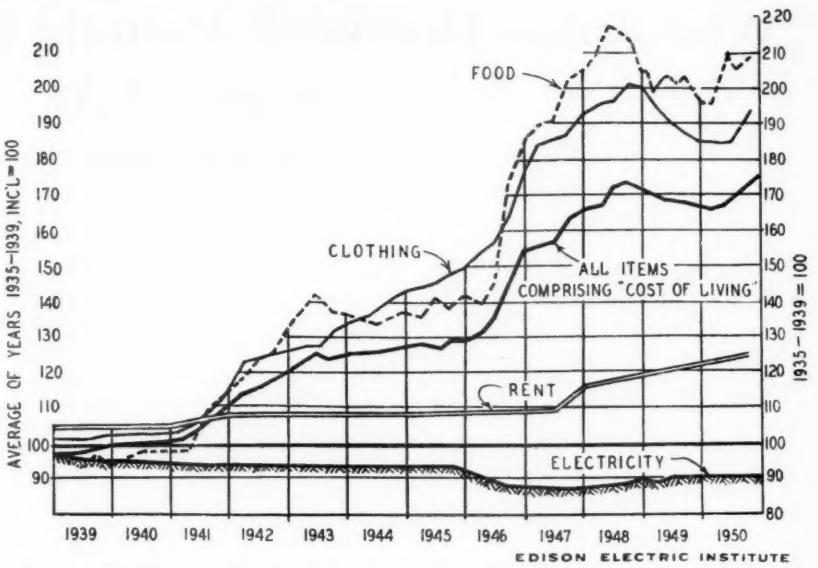

*Fig. 2—The Cost of Electricity as Compared with the Cost of Food, Clothing and Shelter—*1939 *to* 1950 (*Bureau of Labor Statistics*)

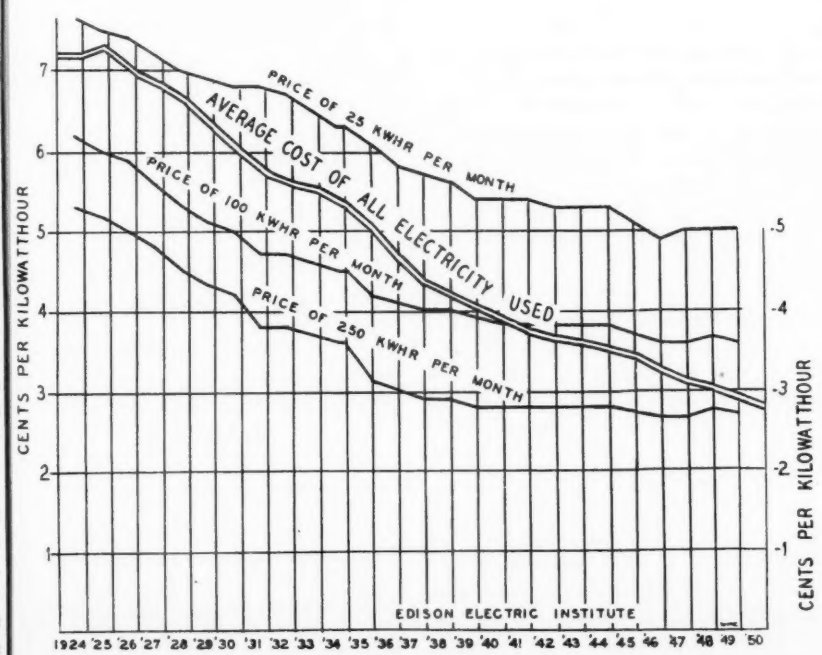
PRICE OF 25 KWHR PER MONTH
AVERAGE COST OF ALL ELECTRICITY USED
PRICE OF 100 KWHR PER MONTH
PRICE OF 250 KWHR PER MONTH
CENTS PER KILOWATTHOUR
CENTS PER KILOWATTHOUR
EDISON ELECTRIC INSTITUTE
1924 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

*Fig. 3—The Trend in the Price of Residential Electric Service—*1924 *to* 1950

Men and Women of Electric Industry Are Most Important Resource

Because electric power is basic to the nation's strength, the men and women of the electric industry make up one of the most valuable components in the U. S. working force. They are the most important of the electric industry's resources—through the consistent quality of their performance and the vast amount of experience they have gained in meeting and successfully solving the special problems and situations inherent in operations during periods of stress.

Power plants and transmission systems of the industry are run by competent, loyal, experienced, skilled forces of operators, whose ability to turn out the power has never failed in the hour of need. This is a record of which all of us in the industry are proud—and we shall guard it in all future emergencies with all the determination we possess.

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What Britons Discovered About the Electricity Industry in the U.S.A.

By Cyril Dunn

From the Washington (D. C.) *Star*, November 12, 1950

LONDON—In America, each industrial worker uses about three times as much electricity as each worker in Britain. Does the key to increased productivity lie in raising the standard of electrification in this country to something like the American level?

If it does, British industry would have to be given an additional amount of electrical energy as great as that now being used by the whole country. The extra plant needed would require some 650,000 kilowatts a year over and above the amount required to cope with the present annual growth of the load. At this rate of expansion, British industry would reach by 1960 the position American industry is in now.

This is the conclusion reached by a team from the British electricity supply industry sent over to the States, under the auspices of the Anglo-American Council on Productivity, to study American methods. The team's report is the first in the long series of industrial reports already published by the council to come from a nationalized industry.

Look for Ideas

The rate of expansion foreseen by the team is not, in fact, as startling as it may seem to be. The British Electricity Authority already aims at lifting the present annual rate to 1.5 million kilowatts by 1954. And by 1957 they hope to have it up to 1.8 million kilowatts.

The report says it was "the general opinion of Americans" that for full and rapid economic recovery in Britain, the provision of more electricity generating capacity was "a fundamental requirement." The Americans thought we should give it priority over any others.

The team decided that, in an industry such as theirs, high productivity meant giving the best service to the most people at the lowest cost. Combing the States for ideas on how to improve productivity within this definition, the team found "comparatively few large and outstanding things, but rather an aggregation of many small items."

But it is clear that what impressed the visitors most deeply was the ease and the speed with which America can expand and develop its resources of electrical power. The Americans, when they set out to provide more power stations and to widen their net of transmission lines, come up against none of the "troublesome" and "exasperating" delays which, the report says, hamper expansion in this country.

In its conclusions (unlike other productivity teams which have already reported, this "nationalized" team submits no recommendations), the team writes:

"In the face of our present urgent need for more and more stations, it is doubtful whether delays such as occur in this country can be justified. American methods point the way to a severe streamlining of our complex procedure."

The Americans can get a new power station going in little more than half the time it takes here. In Britain, when a site has been chosen as technically desirable, two years or more may pass before the authority can get permission to locate a station there.

U. S. Moves Faster

In America, overhead mains are general, except in the city centers. Rights of way are easily obtained and nobody minds using the same pole for power lines and communication lines. Here, constant objections are raised to overhead construction. Lines have often to be rerouted, disregarding cost, because of local objections.

But even when the way is cleared for a new station and its power network, the British suppliers are held up by delays in the delivery and erection of plant. In the States it takes 24 months to deliver and erect a boiler; here it takes 48 months or more.

And what is behind all these reasons why the American electricity industry gets better service? In the opinion of this team, it is "the keen competitive spirit" among American manufacturers, compared with the almost complete lack of competition between plant manufacturers in Britain.

Because Britain is obliged by her acute shortage to go on using some old and inefficient generating units, she cannot yet compete with the Americans on the finer points of operating policy, says the team.

In America the electricity industry workers are "noticeably keen" for the success of their undertaking and have a highly developed sense of service to the community. On the maintenance side the team found workers willing to do many of the routine jobs on the power transmission network with the lines "live," where in Britain the lines are often made dead for considerable periods.

The Americans seem to have taken a particular interest in this first team from a nationalized industry and, says the report, were found to be holding many false notions about the nature of a nationalized industry. The team had to spend some of its time patiently explaining that the British electricity industry still has to pay its way and to raise its capital in the open market, and that it still enjoys "freedom from political interference and patronage."

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HANDBOOK REVISION COMMITTEE of the METER AND SERVICE COMMITTEE

EDISON ELECTRIC INSTITUTE
420 Lexington Avenue
New York 17, New York

More Power for America

By Charles E. Wilson
President, General Electric Company

From an address before the National Press Club, Washington, D. C., December 5, 1950

ONE of the things I bore away with me from my War Production Board days is that talk in Washington is not cheap, as is commonly supposed. It can be very costly. I should like to use as much restraint as possible in spending it here.

Pressure on Private Business Increased

My subject is electric power. It was said last May that in the United States today the political setting is conducive to rising economic activity, our policy being one of maximum employment at home plus economic rehabilitation and the improvement of security abroad. The role of our government, in the implementing of this policy, has continued to grow, as you know, and one of the effects has been to increase the pressure on private business. Business has complained and fought back against that pressure, but happily in the process it did not dare to relax, and it fought back with its best weapons—intelligent and courageous expansion, continued scientific and economic research, improved communication with its employees and its public, and greater productive efficiency. Courage, in this case, was not mere words, but the investment of billions of dollars for new plants and machines.

National Security Program

With the summer came the shock of Korea and the first clear glimpse of the calculated and malignant forces of aggression. That shock set off—authentically, but a little late as usual—our present national security program, and the effects and implications of it are mounting by the hour. This is a curious kind of hot-cold picture, as newsmen well know, with all of the planning by government and business that we associate with a full-scale war effort—but with no full-scale war. We have the tragedy of thirty thousand casualties, and so far not even an official denunciation of the guilty parties, but it is not a full-scale war. But there is war enough to intensify certain important issues—the issues of *manpower, materials,* and *productivity*. Perhaps we are being given an extraordinary opportunity, not granted last time, to count our money, our men, our resources, and our facilities.

And so we come to electric power, which is at the same time a vital material or commodity and a dynamic instrument or tool by which it is possible to increase our productivity. It is a two-edged sword, or a double-bladed plowshare, as you please, and while this dual quality adds to its value, it also tends to trip up the statistician and the unfamiliar administrator. Not for one moment do I feel that members of the press also would fall into these traps, but so that we can all start even, let me just run through the bare fundamentals—the blocking and tackling of the subject, so to speak.

Fundamentals of Electric Power

The basic power unit is the watt; a kilowatt is a thousand watts; and a kilowatthour is the using-up of a thousand watts of electricity for an hour, which is what you do if you burn ten 100-watt incandescent lamps for an hour, at the cost of a few cents. Electric generating equipment is rated in kilowatts — a 25,000-kilowatt turbine, for example—while electric current is produced and sold in terms of kilowatthours.

Certain of our government bureaus have been among those claiming that as we crank up our defense program and bring it to speed, we are going to have a serious power shortage, unless something drastic is done to prevent it. Spokesmen for the private utilities say this isn't so. In government parlance, that "something drastic" usually means more public power projects. You might rightly conclude that the gentlemen on both sides of this question are interested parties.

Perhaps the electrical manufacturer is also an interested party, but with this difference—he is the fellow who has to make the machines, regardless of who operates them, and he is therefore interested primarily in getting the facts. If his facts and his surveys and his estimates are wrong, he is likely to go out of business. It is the judgment of the manufacturer that I am offering you, therefore. Here is that considered judgment; let me give you the conclusions first, and then go back and pick up the reasons.

Forecasting and Planning

We believe the electric utility industry has done an excellent job of forecasting, planning, and preparing to take care of the country's power requirements. The electrical manufacturing industry has also forecast and planned very carefully; it has provided the facilities and it has produced the power supply equipment needed. There is today enough power to meet present needs with a safe reserve margin. There will continue to be enough power to meet anticipated needs if the equipment—now on order and planned by the electric utility industry—is built and installed as scheduled, despite a shift to a partial war economy. There will be, in our judgment, no power shortage *unless* one or more of the following things happens:

Factors Which Affect Power Supply

1. If major war production projects, such as aluminum plants or special new bomb projects, are heedlessly located in sections of the country where power can't be made available to them.
2. If the present manufacturing facilities for utility power supply equipment are diverted to other purposes, thus delaying production schedules of equipment already on order.
3. If the materials necessary to producing this equipment are not made available as a vital part of the overall defense program.

What is our basis for this thinking? First off, let me say that we must believe this, in the General Electric Company, because all of our production planning and budgeting are based on these figures. We estimate that all defense

expenditures will increase from the $12,000,000,000 of 1949 to about $46,000,000,000 in 1952, dropping back to about $41,000,000,000 in 1953. We are assuming full employment, capacity operation of all industry, and continuing industrial expansion through 1953. We have factored in all the plans and commitments for war production that are known, plus a heavy production of civilian goods. We are assuming some lengthening of the work week. In estimating power requirements we are here considering what practically amounts to a wartime level of industrial activity.

Peak Load Estimate

On the basis outlined here we find there is indicated for 1953 a *power load*, or total demand, of 416,000,000,000 kilowatthours. This is 43 per cent higher than in 1949. We estimate the *peak load*, or the largest demand that will ever be made for electricity at a given time, to be 77,400,000 kilowatts in 1953, or 37 per cent higher than in 1949.

Incidentally, on a comparable basis, these figures are within one per cent of the figures recently published by the Edison Electric Institute, although we arrived at them independently. These are the dimensions of the demand that should be made upon us.

With the power-generating equipment that has already been scheduled by the electrical manufacturing industry through the first half of 1953, and assuming that the suppliers of power are permitted to install the additional capacity they have planned for the last half of that year, the nation will have a margin of reserve generating capacity 20 per cent above the estimated load peak in 1953. I think you will find this fact important: in order to wipe out this margin of reserve, we would have to see a growth of the electrical load through 1953 almost double (actually 95 per cent more) the increase of 87,000,000,000 kilowatthours we have estimated for this 1950-53 period.

Bases for Estimates

Incidentally our estimates of power requirements are based on median hydro conditions—drought would cut the margin of reserve capacity but would not wipe it out. Of course, some people think we have an answer for that at Schenectady, too, as we can always call in our artificial rainmakers. Seriously, if it were not for one or two regions that are low, we would realize our objective of a 25 per cent reserve margin in 1953 instead of 20 per cent.

Suppose war production should be expanded *beyond* the levels forecast here—would there be sufficient electric power to support the added manpower available? Let us assume that we retain a reserve of 5 per cent of electric utility generating capacity, to take care of breakdowns, and devote all the rest of the estimated 1952 margin to increasing production. This is using the horse to invoke the cart, if you follow me, but in that case industrial production would be at a level which would require 5,700,000 (or 38 per cent) more manufacturing employees than today's high level, working 42 hours a week. And if they work 45 hours a week, the peak in the last war, we would still need 4,300,000 (or 30 per cent) more people.

Manpower Is the Bottleneck

The labor force is growing approximately a half-million a year. We are already in a situation of almost full employment, and according to the figures in last week's *U. S. News*, adding less than another 3,000,000 will achieve peak defense production planned for the end of 1951. Simultaneously we are driving for a 3,000,000-man fighting force. It would appear, therefore, that manpower—not electric power—would be the bottleneck in such an emergency.

In this connection it is worth noting that although the electric industry must have enough generating equipment available to meet the peak demand, even if it lasts but minutes or hours, this capacity is not needed for a large part of a normal one-shift day. Much of it can be put to work for many more hours. For three shifts the capacity is theoretically tripled, although from a practical production standpoint, a third shift never actually delivers its theoretical quota. Also, total power demand does *not* increase in proportion to the amount of power going into defense production. A substantial part of the added defense demand comes about automatically as a result of the diversion of manpower and materials; either of these is more likely to cause bottlenecks.

There is not time enough here to discuss the relation of power to the production of aluminum or steel. Aluminum, which requires about a million kilowatts of installed capacity to produce a billion pounds, is still not in my judgment going to be any threat to our present or potential power production resources. The steel industry has also done a fine job of providing needed capacity, and is on the way to improving that job. I think the important thing to remember—and it seems to be the thing so often overlooked in government planning—is that there are really no absolute limitations on our ability to produce in peace or war; the limitations are relative ones—the relation of manpower and materials and facilities and electric power to each other.

Manufacturing Capacity

So far we have talked about the dimensions of the power demand and the ability of the electric companies to meet it. Here are some figures from the manufacturing point of view. Our industry will ship to these companies in the three years 1950 through 1952, based on orders already scheduled, 21,300,000 kilowatts of electric generating equipment. In 1953 they will need another 7,000,000 kilowatts, and the industry will supply that. In fact our manufacturing capacity is somewhat greater—it will be 11,000,000 kilowatts in 1952, for example, and General Electric alone will be able to supply 5,200,000 kilowatts.

Our capacity for large steam turbines alone has gone up 60 per cent in the last 10 years, thanks to a new $30,000,000 turbine plant, covering 20 acres of land at Schenectady, completed in 1949, and which I thought for a time might be dubbed "Wilson's Folly." Today General Electric can produce more electric generating equipment than the entire industry produced before the war, and twice as much as *we* produced before the war.

Diversion of Electric Equipment

Let me give you just one more figure, because it leads into a statement I made in the beginning. In World War II General Electric alone produced 28,000,000 horsepower of *ship propulsion* equipment, which is equivalent to 45 per cent of the total installed capacity of our electric companies at the beginning of this year.

You will recall that, in forecasting that there would be no power shortage, I stressed the fact that one condition would be that present facilities for

building generating equipment for utilities must not be diverted to other purposes. The program I have outlined does not provide generating equipment for the Navy and Merchant Marine, for portable power units, or other special uses. This is an extra job. To make this equipment requires a different kind of plant, and it must be planned well in advance of specific demands for production. If it is not built in advance, it will be ready too late and will cost more. For example, to obtain the same production facilities in a 2½-year period instead of a 4-year period a plant of 2,300,000 square feet would be needed, instead of one of 750,000 square feet. The only way to meet such a demand is to provide entirely new facilities for it, not to divert existing facilities scheduled to meet the demands of the electric companies. General Electric is prepared to establish these facilities—in fact we presented such a plan last week to the Navy and Maritime Commission.

Electric Manufacturers and Utilities Always Lead Drive for Greater Productivity

It is my hope that I have been able to shed some light on this tremendously important subject of electric power, and its role in the unfolding picture of American productivity and American security. It is especially important that you understand and share my convictions in this. I have tried to give you some reasons, in these facts and figures, for putting your confidence in the ability and vision of a great American industry. By the very nature of our business, electrical manufacturers and electric utilities have always had to be out ahead in the drive to achieve greater productivity for the United States. We always have been— we were in the last war—and we are today. We intend to stay ahead.

Facts and Figures Used by Mr. Wilson

ESTIMATED INDUSTRIAL PRODUCTION

(Federal Reserve Board Index)

Year	(1935-39—100) Index
1949	176
1950	197
1951	220
1952	230
1953	225

ANTICIPATED DEFENSE EXPENDITURES

(G-E estimates, in billions of dollars)

Year	*Total Defense Expenditures*	*Combat Material (hard goods)*
1950	14.2	4.5
1951	33.0	17.5
1952	46.0	25.0
1953	41.0	21.0

POWER LOAD GROWTH

(In billions of kilowatthours)

	1940	*1943*	*% Increase*	*1950*	*1953*	*% Increase*
Large Light and Power Sales	59.6	106.7	79	139.0	175.0	26
Small Light and Power Sales	22.4	28.2	26	50.2	62.8	25
Domestic and Rural Sales	25.3	31.6	25	74.7	101.5	48
Total Generation	145.0	221.0	53	329.0	416.0	27

Estimated increase in industrial production from 1950-53 is 17%, compared with 92% from 1940-43, while the growth in power sales relative to production is expected to be substantially greater than in World War II.

CAPACITY FOR MANUFACTURE OF GENERATING EQUIPMENT

The industry is turning out all kinds of generating equipment at a rate of 6,855,900 kilowatts per year in 1950, of which 6,074,000 kilowatts is for utility systems.

Capacity for 1952 is 11,000,000 kilowatts (5,200,000 kilowatts is GE) with 8,316,000 kilowatts now scheduled. Open capacity is 400,000 kilowatts for hydroelectric machines and 1,200,000 for steam machines under 10,000 kilowatts. (SOURCE: EEI Survey of Manufacturers.)

LARGE STEAM TURBINES SCHEDULED FOR EQUIPMENT

(10,000 kw and up)

Year	*For U. S. Utilities*	*For Export and Industrial*	*Total*
1950	4,913,500 kw	373,500	5,287,000
1951	4,939,500	1,265,500	6,205,000
1952	6,686,000	272,500	6,958,500

This information (from the EEI Eighth Semi-Annual Electric Power Survey) plus scheduled shipments of hydroelectric equipment plus estimated shipments of steam turbines under 10,000 kw and internal combustion generators, indicates that total shipments of generating equipment to utilities in 1950-52 will be as table here indicates.

1950	6,270,000 kilowatts
1951	6,500,000
1952	8,480,000
	21,300,000 kilowatts

LOAD, PEAK, RESERVE

Estimated power load for 1953—416 billion kwhrs (43 per cent higher than 1949).

Estimated peak load for 1953—77.4 million kw (37 per cent higher than 1949).

Estimated reserve generating capability over 1953 peak—20 per cent.

Wisconsin Utilities Association Gas and Electric Convention Draws Enthusiastic Response from Delegates

COMBINING engineering and sales meetings in both separate and joint sessions, the Gas and Electric Section Convention, Wisconsin Utilities Association, Milwaukee, Wis., Nov. 8-10, set new attendance records and brought forth enthusiastic response from the 568 delegates attending the convention. Subjects of common interest to management, engineers, sales forces, equipment manufacturers, distributors and service companies, which were dealt with at the joint engineering and sales sessions, included a report on electric load studies at the association's research farm; a frank presentation of methods to prevent accidents; new opportunities for home service work; and a pointed address on public relations.

Division Officers Elected

Separate sessions for sales and service, technical electric and technical gas divisions were held during the course of the three-day meeting, covering important topics pertinent to their respective fields. Officers for these divisions elected at the convention included: Technical Division, Electric Section—Carl J. Forsberg, vice-president of field operations, Wisconsin Power and Light Co., chairman; N. J. Fischer, superintendent of distribution and transmission, Mississippi Valley Service Co., vice-chairman; Sales and Service Section, Electric Division—William H. Wagner, sales manager, Wisconsin Electric Power Co., chairman; Ross Williams, manager, commercial department, Wisconsin Michigan Power Co., vice-chairman.

A prediction of ample electric and gas supply for Wisconsin's farms, homes and industries even in a quasi-wartime economy, barring possibilities of a severe drought or government restrictions on manufacture of generation or distribution equipment, was voiced at separate opening sessions of the electric and gas divisions by both E. W. Deterling, Northern States Power Co., chairman, electric division, and G. G. Ellerbock, Wisconsin Public Service Corp., chairman, gas division.

Citing facts from a survey conducted in Wisconsin, Mr. Deterling said that "11 Wisconsin electric companies will add 139,000 kw to their generating capacity in 1950 at a cost of more than $22,300,000. These companies will add $5,500,000 to their investment in transmission plant and $19,000,000 to their distribution plant.

"Our survey shows that the margin of reserve capacity over the estimated peak demand in 1950 will be 16.5 per cent," he continued. "For 1951 the estimated reserve margin will be 14 per cent; for 1952 the estimated reserve will be 19.5 per cent; and for 1953 the estimated reserve will be 17.9 per cent."

Combination Session

At the joint sessions, both engineers and sales personnel heard C. B. Boulet, personnel director, Wisconsin Public Service Corp., give an address analyzing employee attitudes toward safety. "Before any individual will cooperate in any effort, he must have assurance of the sincerity of the person seeking his cooperation," Mr. Boulet said. "When this point is reached, the full effective cooperation of the employee groups in the accident prevention program will be secured and the frequency curve will begin to drop below the average . . .

"To me, simply lip service is not enough," he continued. "The organization must understand that the top executive will not tolerate unnecessary accidents any more than he will tolerate waste, or the beating up of a customer, or serious interruptions in service which could be avoided."

"Given a top executive," Mr. Boulet concluded, "who makes it his business to follow up on a safety program, plus the right employee attitude and training, and accidents won't happen."

Customer Relations

Final speaker on the joint program, Donald Hoover, president, Bozell & Jacobs, New York City, warned against the "use of sheer intuition in the arts of public persuasion and talking to persons already convinced . . ." in public relations and advertising programs. Mr. Hoover also stated his conviction that operating utility companies had neglected many useful channels of communication with the public and in particular called attention to the discontinuance of the use of bill enclosures, which he said reach "all customers, without waste circulation, and at the particular time when their attention and interest are directed to the subject of utility service."

Engineering Sessions

Delegates at the technical Electric Division sessions were told by M. G. Morrow, Wisconsin Michigan Power Co., and chairman of the association's Emergency Aid Committee, that revised plans for the exchange of emergency aid among companies had been worked out.

Chairman of the Farm Sales Committee, A. A. Pfingsten, pointed out that "all but 2 per cent of the farms in the areas served by electric companies in Wisconsin now have electric service and 99 per cent have service available."

"The average annual use of electricity in company areas continues to climb," Mr. Pfingsten said. "On July 1, 1949, the average annual use was 3158 kwhr. On July 1, 1950, the average use increased to 3443 kwhr, a gain of 9.47 per cent."

W. L. Lawrence, promotion department, Radio Corporation of America, who gave an address intended to assist electric companies in arriving at an accurate and helpful basis on which to assess their relationship to television, estimated annual revenue to electric companies from television receiver use as between $31.5 million and $110.6 million by 1951, based on an estimate of present television receivers in the U. S. and the number to be sold in 1951.

Other speakers who discussed electrical subjects included: C. A. Scarlott, manager, engineering publications, Westinghouse Electric Corp.; M. A. Eklund, electric distribution engineer, Northern States Power Co.; L. W. Wyss, power production superintendent, Wisconsin Michigan Power Co.; E. W. Hatz, transmission engineer, Wisconsin Electric Power Co.; W. T. McCullough, vice president, Babcock & Wilcox Co.; J. R. Norton, turbine engineering division, General Electric Co.; W. J. Rheingans, Allis-Chalmers Manufacturing Co.; and G. A. Des Rosier, Mississippi Valley Public Service Co.

Sales and Service Session

More than 140 persons attended the Sales and Service Section session, which

(*Continued on page* 450)

Why Accidents Don't Happen

By C. B. Boulet

Personnel Director, Wisconsin Public Service Corporation

An address before the Wisconsin Utilities Association Gas and Electric Convention, Milwaukee, Wis., November 8-10, 1950

THE utility industry has come a long way in the past quarter of a century in the fields of power generation, transmission, gas production and distribution, transportation, rural electrification, sales, and accounting. Adjustments and improvements have been made year after year. Management of public utilities can well be proud of these achievements. Statistics that have been recited to support these achievements have been honest and have proven the main point that has been emphasized, that is, "We are good, aren't we?"

Importance of Accident Prevention

There is one phase of our operation, however, that has to my knowledge never been mentioned in the recitation of deeds well done. Whether the omission has been deliberate because the record has not been good or whether the problem has been considered of such insignificant importance compared to financing, sales, production, and distribution is beside the point. I suspect it is the latter that has brought about the startling silence. Of one thing I am sure—the problem about which I have been asked to talk is a terrifically important one and will continue to be important under a tight labor market and requirements of the armed forces and industry for more and more men. The title of my talk indicates the problem to which I refer—that of stopping accidents to our employees.

A Blot on the Industry's Operations

We might just as well face some unpleasant facts before we attempt to find a solution to the problem. I am, therefore, going to drag the record from the files in order that we may all recognize that there is a blot on the industry's operations and that the quicker we acknowledge that fact, the quicker the blot can be erased.

Let's take a look at the record of the public utility industry over a period of years. In referring to the National Safety Council's statistical records, it is indicated that in 1931 the public utility industry had a frequency of 13.1 accidents per million hours of work. In 1948 the frequency for the public utility industry had risen to 17.2 accidents per million hours worked. In 1949 it was 15.9.

For fear that some electrical men or some gas men might point their finger at the other fellow, I am also going to give you the statistics for the gas and electric industries separately. Here they are. In 1931 the electric industry had a frequency of 12.89 and in 1949, 14.02. The gas industry has had a higher frequency but the record over the years shows no greater improvement. In 1931 the gas industry frequency was 15.97 accidents per million hours of work and in 1949 it was still 17.92.

Facts Cause Concern

Needless to say these facts are discouraging and should cause concern, particularly among representatives of top management. They are of still greater concern when it is recognized that a number of both gas and electric companies have dropped their frequency to one-third or one-fourth of the national average and have, over a long period of years, maintained this excellent record. It follows, of course, that these low frequencies in certain companies must mean that other companies have extremely high frequencies — all of which are two or three times the national average.

The record in our industry has not kept pace with the overall industrial accident prevention picture. In 1931 the average frequency rate for all industries was 15.12 while in 1949 it had dropped to 10.14—an improvement of 33 per cent.

That's the record and it is not one of which we can feel very proud.

The first question which arises is "Why doesn't the situation improve, particularly when it is a fact that virtually every public utility has a safety department and is spending thousands of dollars to stop accidents?" The second troublesome question is "Why is it possible for two companies carrying on the same operation and each having a safety program to have such a wide divergency in their accident experience?" Why is it possible, for instance, for Company A to go year after year with virtually no fatalities and with a frequency of one-third or one-fourth of the national average, while a neighboring company of similar size and similar operation continues with a frequency well over the average?

Why Is Accident Rate Higher in Some Companies?

These questions become even more irritating when it is recognized that both companies indicate an interest in stopping accidents and both of them have access to the same protective equipment, the same techniques, the same poster service, the same construction standards as the other.

Just what does Company A have that Company B lacks?

If we were making comparisons of technical processes, we might jump to a quick conclusion that certain companies had developed some secret means of production which they had patented and that these secrets were not available to the other companies. This is far from the truth however. No company has ever claimed patent rights on any part of its safety program. This is an area where there is full cooperation between companies in an effort to reduce the pain, suffering, and hardship that come from accidents. There is, in fact, no other field in which ideas, plans, and programs are so freely interchanged as in accident prevention.

Analysis and Suggestions

Why then does not Company B with a high frequency follow the lead of Company A and achieve the same results?

If we could discover the answer to this question and couple with it an analysis of what constitutes the priceless ingredients which must be a part of one program and not of the other, then the utility industry should be able

to reduce its frequency well below the present average.

While I do not believe that any one individual has these answers, I am going to make some comments and suggestions which appear to me to be sound.

First of all, let's analyze the programs of the companies with good records in an effort to discover this priceless ingredient.

All Companies Have Safety Programs

We find that these companies all have organized safety programs, but so do the others. We find that protective equipment—gas masks, rubber gloves, line hose, grounding equipment, leak detectors, etc., etc.—are furnished the employees of the company with the good record, but further investigation shows that these things are likewise furnished employees of the high frequency companies.

We find that machines are well guarded, that equipment installations meet safety code requirements, that inspections are made to guarantee the safe maintenance of walkways, ladders, platforms, equipment, and premises; but again further investigation shows that all of these things are true of the company with the poor record.

The comparison to this point is discouraging and the assumption could readily be made that both companies are on a similar basis which would, of course, lead to no conclusion as to why the one has a good record and the other a poor record. Here then is the tip-off. There must be something beyond physical equipment, something beyond protective devices, and something beyond inspections and checking services.

Employee Attitudes All Important

Careful thought leads to but one conclusion. The difference lies in the attitude of employees. It can be found in the emotional and mental makeup of employees.

We are, of course, primarily concerned in the discussion with employees' attitudes toward safety, but whether it be safety, or production, or economy, or free enterprise, or any other phase of our operation on which it is desirable to create a good attitude, there must exist a cooperative attitude toward the company, the boss, fellow workers, and the job. Without this foundation, the development of a mental condition which creates in the individual a strong active desire to participate and to achieve the objectives of the team is impossible.

What then are the factors which create this underlying attitude that is so necessary as a starting point? Many surveys and studies have indicated that the employee must have certain satisfactions in order to be receptive to any management program. Among these satisfactions or his desires are:

1. To be part of the team and to be so recognized by his boss and by management all the way to the top. Closely associated with this desire is the wish to be recognized as an individual, not as a number or just a cog in the machine. His self respect must be satisfied and he must be treated as a person—as "someone," if this is to be accomplished.
2. Job satisfaction. As Elton Mayo says, "The psychological security that comes from good work, the recognition of it and the spirit of the group about him."
3. To be treated "right" compared to other employees. That means he wants equitable pay, comparable benefits, and no favoritism shown.

Secure Employee Cooperation

How does all this tie in with safety? Remember, before any individual will cooperate in any effort, he must have assurance of the sincerity of the person seeking his cooperation. Through the satisfaction of the desires I have mentioned will come a deep confidence that his boss, the company, and top management are sincere. When this point is reached, the full effective cooperation of the employee group in the accident prevention program will be secured and the frequency curve will begin to drop below the average and will tend to reach the point at which we are aiming.

It must also be kept in mind that in developing a safety program this question of sincerity, that is, an honest desire on the part of the company for safety, will be forced to stand the subconscious but nevertheless searching analysis of each employee. Certain it is that if a company preaches safety but at the same time fails to protect mechanical hazards or insists on employees doing things they know to be unsafe or refuses to supply protective equipment, it will create grave doubts in the minds of employees as to its sincerity and the program will not succeed.

Briefly then, in the company where there has been a successful program will be found the confidence of the employees in management—from the foreman to the president—and with that confidence will go a receptive attitude and a desire to cooperate in the program instituted by management.

Inspire Teamwork

I wish it were possible to discuss fully the matter of being a part of a team and how this can be achieved. I wish we had time to talk about job satisfaction and what can be done to create that attitude. These are subjects that would take long and detailed studies and conferences to cover. They are problems which are familiar to personnel men, and it is my suggestion that the personnel executive be called in to help in developing this foundation for the safety program.

With this receptive and cooperative attitude as a starting point we are now in position to use every means at our disposal to maintain in the mind of the employee an active interest in the problem of not having accidents.

Statistics show that the large majority—over 90 per cent—of all accidents happen because of man failure, not because of equipment failure or mechanical failure or failure to provide guards. When we speak of 90 per cent of accidents as due to man failure, we are referring primarily to a failure due to something which has affected the mental process just prior to the accident; inattention, lack of concentration, failure to analyze the job, failure to recognize hazards, preoccupation in subordinance, worry, anger, resentment, etc. I sometimes think that the term "safety engineer" is an erroneous title. It should be "safety psychologist" if we are to find the right approach to the correction of the mental conditions which cause the great majority of accidents.

Think Safety

Experience has proven that any plan or procedure which makes a man think safety and makes him feel that safety is of first rank in importance will aid in cutting into the 90 per cent of accidents chargeable to man failure.

I am not going to discuss in detail the techniques which are known to every safety man and which accomplish this

purpose. Among them are safety posters, safety committees, awards, individual recognition, competition of the company in contests, competition between groups, safety meetings, moving pictures, recordings, plant communications, etc. Again, however, I want to emphasize that while these activities are all a part of virtually every safety program, they can only be effective if the employee is in a receptive, cooperative frame of mind. So we get back again to the basic reason why a program in one company works and actually reduces accidents and why what appears to be the same program in another company fails.

Employee Placement

There are two other things that I would like to mention which go a long way toward making programs effective. The first is related directly to the matter of attitudes. It is a truism that the expert mechanic seldom gets hurt. This fact points the way to the second problem which underlies the development of a good safety program; that is the problem of having capable, well trained, intelligent workers. Here again is a subject that should be developed in a series of discussions rather than touched upon in this brief analysis.

The development of an expert worker starts with the selection and placement of the individual. The armed forces of the U. S. have discovered this fact and today each man coming into the service is processed through checking, testing, and interviewing in an effort to find where he will be most effective. It is virtually a job to keep a square peg from being forced into a round hole.

Vocational Tests

Many of the larger utilities have, for some years, used selective placement tests with marked success. Smaller companies are discovering that they too can do a better job of employee selection and placement through the use of these tests. Both the American Gas Association and the Edison Electric Institute Industrial Relations Committee are engaged in research work in an effort to design and validate specific tests which will be a further aid.

Step I then in getting "experts" is the careful selection and placement and step II the subsequent training of the men who are selected. If we are to have a corps of well trained men, men who know how to do each job, men who can analyze the hazards and protect against them before the job starts, the job training programs must be extended into all fields of activities.

Hand in hand with job training goes another job which to me seems even more important. It is really job training, but of a little different nature. I refer to the training of foremen and supervisors on how to supervise. We will not achieve job satisfaction until men who are supposed to supervise others don't just "handle" them. The program for supervisory training should include fundamentals of accident prevention as well as other problems of leadership.

Finally, and although I have placed this last in my discussion, I am convinced it should be No. 1 in importance, there is executive leadership.

Without exception, every company with which I am familiar that has a good accident experience also has personal active interest on the part of the top man in the company.

I fully realize that company presidents have many problems. There are many demands on their time. They must face and solve the problem of meeting load requirements, problems of finances, public relations, taxes, and contracts with government bodies. All of these are important and all require the careful thought and decision of the top executive.

Since the lives and safety of employees are important matters, the top executive must also find time to not only indicate his interest in this problem but to insist upon safe operation month after month on the part of his organization.

A well trained, enthusiastic, contented employee group is a utility's most valuable asset. It is a prime responsibility of management to maintain and protect this asset.

Assuming that confidence in the integrity of top management flows through the organization, it follows as night follows the day that supervisors will perform as the big boss insists. When he relegates the job of safety to a subordinate and then assumes that since he has authorized financial backing he can forget the problem, and at the same time goes after the organization virtually daily on problems of economy, public relations, sales, and profit, he will get results on economy, public relations, sales, and profit but he won't get results on safety. Men do what they think appears good in the eyes of the boss. That's human nature: the desire for profit, improvement, and self-preservation.

To me, lip service on the part of executives is not enough. The organization must understand that the top executive will not tolerate unnecessary accidents any more than he will tolerate waste or the beating up of a customer or serious interruptions in service which could be avoided.

The formula then for stopping accidents becomes quite simple.

Given a top executive who makes it his business to follow-up on a safety program plus the right employee attitude and training, accidents won't happen.

Last Call!

FEBRUARY 1, 1951, IS THE DEADLINE

for ENTRIES in the

George A. Hughes and Laura McCall Awards

This is a last-minute reminder that the entries for the Hughes and McCall Awards must be received by the Edison Electric Institute not later than February 1, 1951.

Don't pass up this opportunity to gain well-deserved recognition for your Company and any individuals concerned who have made outstanding accomplishments in the fields covered by the above awards.

Send your entry to:

EDISON ELECTRIC INSTITUTE
420 LEXINGTON AVENUE NEW YORK 17, N. Y.

Consolidated Edison Co. of N. Y., Inc., Employees Receive Meritorious Service Certificates for Courageous Acts

CONSOLIDATED Edison Company of New York, Inc., has awarded its Meritorious Service Certificate to thirty-four employees of the Company or its subsidiaries for saving life, protecting property, or other personal acts performed beyond the normal requirements of their jobs.

Situations Call for Courage

A total of 1,052 such awards have been made since the Company's award plan was established twenty-four years ago in recognition of the fact that utility employees, like members of the fire and police departments, often are faced with unusual situations which call for courage, quick thinking and prompt action, regardless of whether they are on or off duty.

Acts which earned citations currently include rescues and life saving in situations involving drownings, fire, and motor vehicle accidents. In a number of cases System employees saved the lives of other employees or members of the public suffering from various forms of gas asphyxiation by promptly applying artificial respiration.

Joseph A. Rodriquez, a mechanic, saved a school girl who jumped into the East River from probable drowning. While other men sought help, he dove in after her and, despite a strong tide, brought her near the dock where others pulled her to safety. Earlier this year Mr. Rodriquez received a cash award and the Bronze Medal Pin from the Life Saving Benevolent Association of New York for this act.

Barge Captain Rescued

A coal barge captain who fell into the river at an electric generating station dock was saved by William Callanan, a mechanic. Mr. Callanan first threw a life preserver to the man who, foundering in heavy winter clothing, was being carried from shore by a strong current from the station's discharge tunnel. Mr. Callanan was pulling the captain in by the cord attached to the life preserver when other Edison employees arrived to help lift him from the river.

Three men rescued a boy trapped in tidal mud while playing on the shore of Randalls Island. They were Alexander Chisholm, a foreman; Victor F. Lindberg, a troubleman and Robert M. Ambrose, a maintenanceman.

Two occupants of a burning hotel room were rescued by James E. Day, a senior clerk with the Consolidated Telegraph and Electrical Subway Company, an Edison subsidiary. For this act Mr. Day received his third award in four years.

Noticing smoke coming from a window, Mr. Day reported the fire to the hotel desk and turned in an alarm. Then he helped a hotel employee force open the door to the burning room and after helping to get the occupants out, he aided in extinguishing the fire.

Mr. Day's first award in 1946 was for reviving a woman overcome by gas. A year later he observed widening cracks in the foundations of a building, raced through the house to warn the tenants and then turned in an alarm. The building collapsed a few minutes later but Mr. Day's prompt action had saved the tenants from death or injury.

School Bus Accident

While three employees of the Westchester Lighting Company were installing a gas service in Eastchester, a bus carrying a high school basketball team crashed into a tree nearby. The driver was slumped over the wheel and the boys sprawled about, several obviously injured. The Lighting Company men forced the bus doors open, shut off the motor, quieted the boys and got everybody out of the bus.

The three men cited were Jose Couto and Anthony A. Verno, both general mechanics, and Samuel Semanza, an equipment operator. Their quick thinking and prompt action were credited with preventing a possible fire and averting a panic that might have resulted in serious injuries.

Lineman Rescued

In another example of teamwork, William Chisholm, a foreman, and three other employees rescued a man who suffered electric shock while aloft on an overhead line pole. The other three were Harold V. Driscoll, a maintenanceman; John H. Santer, a troubleman and Michael J. Sheehy, a troubleman.

An Edison employee overcome by sewer gas in a manhole was brought to safety and revived by two fellow employees, Anthony J. Forese, an outside plant helper, and Wilford G. La Plant, a splicer.

Four Queens men participated in a similar rescue at the Company's Astoria gas plant when another employee was overcome by gas fumes in a valve pit. They were Bernard E. Leary, a plant foreman; Edward Fritz, a production foreman; Louis Lippert, a foreman operator and Alexander Di Donato, a mechanic.

Gives Alarm

Mr. Di Donato, who first noticed that the man was in trouble, gave the alarm and donned a gas mask so that he could descend into the pit to remove the victim with help from the others above. Mr. Leary immediately applied artificial respiration to the victim while Mr. Fritz got an inhalator. Then Mr. Fritz and Mr. Lippert alternately applied inhalator treatment until medical care arrived.

Two other Queens men were cited for reviving a man overcome by gas fumes while working in a trench at the Astoria gas plant. They were Robert F. Rafanelli and Walter J. Canning, both mechanics. They alternated in applying artificial respiration until an inhalator was brought to completely revive the victim.

Meritorious Service Certificate Awards

Thirteen other Consolidated Edison employees received the Meritorious Service Certificate award for applying their knowledge of resuscitation methods to help save the lives of persons on various other occasions or for otherwise preventing possible injuries or damage to property.

These include John A. Costello, a maintenanceman; John J. O'Dwyer, an accounts collector; Daniel M. Driver, a junior substation operator; Joseph A. Murphy, a serviceman and Joseph P. Canderozzi, a serviceman; Jacob La Rue, a serviceman; Frank A. McCafferty, a serviceman; Hugh Pues a maintenanceman; Harold P. Casper, an accounts collector; Robert J. Crowe, William C. Bell, Martin Fennel, maintenancemen, and Albert Harrison, a meter reader.

A New Method of Controlling Voltage Dips Caused by Motor Starting Currents

By J. W. Anderson

Philadelphia Electric Company

A paper presented before the Transmission and Distribution Committee, EEI, New York City, October 19, 1950

A MAJOR need of the electric power industry is an appliance motor that produces less voltage flicker during starting. Certainly the electric utility needs it; and it would seem that appliance manufacturers should also be interested in a development that would materially improve a critical design limit, i.e., minimum voltage at motor terminals at the instant of starting.

It is the purpose of this paper to propose such a motor, the general basis being a motor which operates at low leading power factor during the starting period and which therefore produces smaller starting voltage dip. Specifically, the following is recommended for the consideration of manufacturers of 115-volt motors:

1. Development of designs for ¼ hp and larger motors having locked rotor currents of about same magnitude as present designs but having locked rotor power factors of the order of 60 per cent leading; *and/or*
2. Development of designs for ¼ hp and larger motors having locked rotor currents up to 50 per cent greater than present designs and having locked rotor power factors of the order of 45 per cent leading; *and*
3. Development of shunt and/or series line starting capacitors having a power factor of the order of 2 per cent, in suitable microfarad ratings to be used in parallel with, or, in combination with suitable autotransformers, in series with small motors during the starting period.

The Problem

In the development of the motor-driven appliance market in past years, there has been a tendency on the part of appliance designers to give insufficient attention to the matter of motor starting current. Considering the fact that in some cases quite high starting torques are required and the fact that, in general, motor costs bear an inverse relationship to magnitude of locked rotor current, this tendency is perhaps natural in this field where competition is so keen. Thus these developments have placed the burden on electric utilities to provide at their own expense whatever distribution facilities are necessary for minimizing starting current flicker, regardless of whether revenue from operation of the appliance is sufficient to justify the expenditure.

Customer Dissatisfaction

Although in recent months cooperative action between electric utilities and one branch of the appliance field, where large 115-volt motors are involved, has been distinctly helpful, nevertheless the problem continues to exist and will assume increasing importance in future years as public acceptance of motor-driven appliances increases. It is well known that the degree of objection to the lamp flicker that accompanies motor starting is a function of magnitude of the voltage dip and its frequency of occurrence. Unfortunately, every customer on a secondary sees part or all of the dip resulting from every start of every motor on that secondary; consequently, as saturation of motor-driven appliances increases, the number and frequency of starts on that secondary increases and consequently the dips accompanying each start must be a minimum if serious customer dissatisfaction is to be avoided.

Development of New Motors

The purpose of this paper is to propose designs of motors and auxiliary equipment which will produce substantially smaller starting voltage dips than present designs, to indicate general means of accomplishing the purpose, and to indicate the actual reductions in starting voltage dips to be accomplished thereby on typical power distribution circuits.

Cooperation of progressive motor designers and manufacturers willing to look beyond the present sharp competition of the small motor industry is solicited in developing motors along the lines to be indicated. There is no expectation that these motors will be smaller and/or cheaper than present-day designs. On the contrary, larger and more expensive motors will undoubtedly be the result. However, investigation of such designs is proposed on the basis that, despite a higher initial motor cost, they may result in lower initial installed costs, and/or lower overall costs to the ultimate user over a period of years. Whether such is the case can be determined only after these designs have been developed, built, and tested, and approximate prices set, based on a reasonable production program. These costs may then be compared with present-day costs, including in both cases expenditures by the customer for installation and by the electric utility in providing adequate electric service.

Lower Appliance Costs

Lower initial installed appliance costs may result from one or both of two factors. In some applications, it is said that motor size is determined by the minimum starting voltage at its terminals under adverse supply and branch circuit conditions, it being necessary to provide a motor with starting torque, under these adverse conditions, sufficient to start the load. Reduction in starting voltage dip will of course provide a higher voltage at the motor terminals and since starting torque is proportional to the square of applied voltage, it may sometimes be possible in these critical applications to use a *smaller* motor rating of the designs proposed than would be possible with conventional motor designs. Likewise, it is frequently necessary to improve starting conditions by installing a new branch circuit with larger wire than the existing size. The reduced starting voltage dip of the proposed motor

may in many instances make such an installation expenditure unnecessary.

A fact that should be an axiom, but is apparently frequently neglected, is that the user of the appliance is the common customer of the appliance manufacturer and the electric utility. He pays the initial cost of the appliance and the house wiring to supply it, and he pays its operating costs. He will be a satisfied customer only if these prices provide him with a device that gives reasonably trouble-free service over a period of years. The quality of his electric service and what he has to pay for it are factors of prime importance in determining whether he is a satisfied or dissatisfied customer.

Thus the mutual interests of the customer, the appliance manufacturer, and the electric power industry are served if the costs of the appliance and its operation are a minimum over a period of years. Naturally, this minimum cost is a combination of first-cost and operating-cost and might be attained by an appliance with a low first cost but high operating costs; or it might be attained by high first costs and low operating costs. Specifically, if an appliance is so manufactured as to require exceptionally heavy utility investment to serve it, then the user should carry this investment in his rate for electric service.

Since motor starting current may become an increasingly important element in the cost of his electric bill, it follows that over a period of years the customer may be better served if he pays a somewhat higher price for an appliance having a motor so designed as to minimize lamp flicker during starting.

A Possible Solution

The possibilities of reduction in voltage drop in supply circuits by the application of condensive devices are well known and have been widely used at transmission and primary distribution voltages. But these principles have not been applied extensively in secondary distribution, partly because the unfavorably high ratio of resistance to reactance in such circuits results in somewhat reduced effectiveness of capacitors. Nevertheless, analyses have indicated that material reductions in starting voltage dips can be attained with combinations of motors and accessory equipment designed to draw starting currents from the line at low leading power factors.

As a specific example of possibilities in this direction, assume a ½-hp motor at MO in Fig. 1. The circuit of Fig. 1 is a simple radial distribution secondary and is basic for the purposes of this paper. Several combinations of transformer sizes and secondary lengths and sizes will be considered later, but for the present numerical example, consider that the circuit is made up as follows:

Transformer	15 kv-a
Secondary—transformer to service pole	400 ft. No. 4
Service loop	50 " " 6
Service entrance	20 " " 8
Branch circuit	30 " " 14

This ½-hp motor has a locked rotor current at rated voltage of 35 amperes at 81 per cent lagging power factor. Suppose by some means, this current can be maintained constant (i.e., constant locked rotor impedance) except that its power factor is gradually changed to 50 per cent leading. Starting voltage dips at the service pole, at the meter, and at the motor are plotted in the CZ (constant impedance) curves of Fig. 2. Note the abrupt improvement in voltage dips with leading power factors.

Another method of achieving leading power factor in the supply circuit is of course the use of a shunt capacitor close to the motor terminals (NOTE: the same effect can be achieved with a suitably designed series capacitor-autotransformer combination at the motor terminals). The improvement in voltage dips by this method is also plotted in Fig. 2, for two values of capacitor power factor. Substantial improvement by this method also is indicated, especially with capacitors of the lower power factor value. It is seen, however, that, except for relatively small changes beyond the 81 per cent initial power factor, this method generally does not produce as great an improvement as maintaining constant current (CZ curves). The reason for this is that the advantage gained by phase displacement at the low leading power

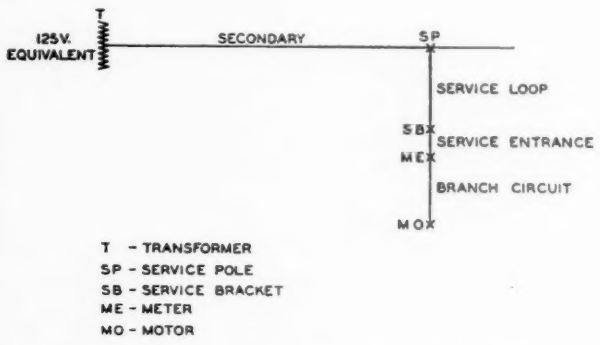


Fig. 1 — Typical Transformer-Secondary Service Combination

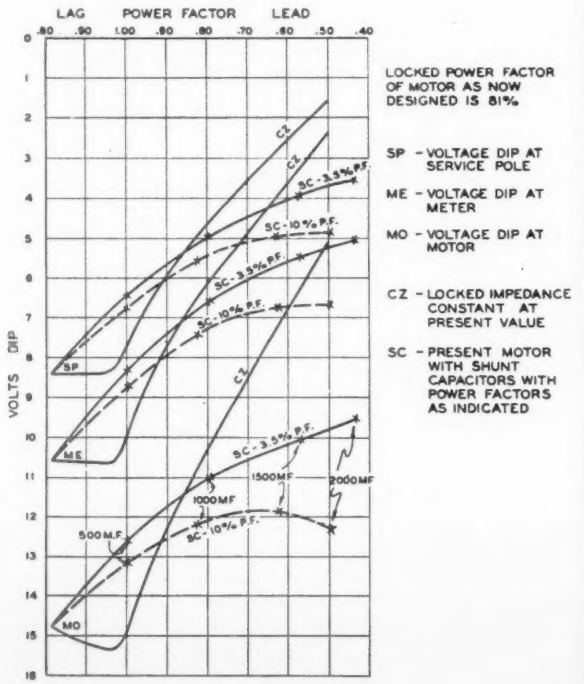
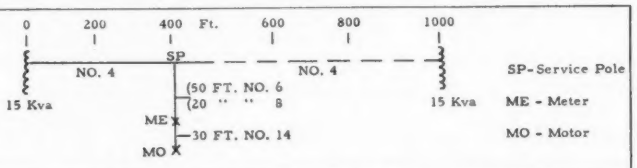


Fig. 2 (Right)—Variation in Starting Voltage Dip with Power Factor of Locked Rotor Current—½-Hp Motor on Typical Transformer-Secondary Service Combination

TABLE I—COMPARATIVE EFFECTIVENESS OF VARIOUS METHODS OF STARTING FLICKER CONTROL—½-HP, 115-V MOTOR



	MOTOR AND SECONDARY COMBINATION		FLICKER VOLTS SP	VOLTS ME	VOLTS MO	RELATIVE SP	RELATIVE ME	RELATIVE MO
1	Motor as now Designed on 15 kva transf. & 400 ft No. 4 Sec.		8.42	10.59	14.80	1.00	1.00	1.00
2	Same as 1, With Autotransformer at 500 Ft.		4.89	7.12	11.46	.58	.67	.78
3	Same as 1, Banked with 2nd Transf. at 1000 Ft.		5.04	7.28	11.61	.60	.69	.79
4	Combination of 2 and 3		3.79	6.04	10.42	.45	.57	.71
5	Motor as now Designed on 15 kva Transf. & 400 Ft. No. 1/0 Sec.		5.02	7.25	11.58	.60	.69	.78
6	" " " " " " 25 " " " " " " 2 "		5.94	8.15	12.44	.70	.77	.84
7	" " " " " " " " " " " " " " 2/0 "		4.10	6.35	10.71	.49	.60	.72
8	" " " " " 5 " " On Service Pole		3.46	5.71	10.10	.41	.54	.68
9	Motor as now Designed with 1500 MF. Shunt Starting Capacitor Of Indicated Power Factor	10% P.F.	4.93	6.72	11.88	.59	.63	.80
		3.5% "	3.92	5.45	10.04	.47	.52	.68
		0% "	3.43	4.83	9.13	.41	.46	.62
10	Motor Present Locked Amp. @ 80% Pf Lead, on 15kva Trans&400ft No. 4 Sec.		4.63	6.17	10.31	.55	.58	.70
11	" " " " " 70% " " " " " " " "		3.57	4.88	8.56	.42	.46	.58
12	" " " " " 60% " " " " " " " "		2.57	3.63	6.83	.31	.34	.46
13	" " " " " 50% " " " " " " " "		1.59	2.39	5.11	.19	.23	.35
14	" 150% " " " 60% " " " " " " " "		4.26	5.86	10.59	.51	.55	.72
15	" " " " " 50% " " " " " " " "		2.89	4.14	8.17	.34	.39	.55
16	" " " " " 40% " " " " " " " "		1.50	2.38	5.69	.18	.22	.38

factors is partially offset by the increased magnitude of line current. For example, the combined current of a 1500 mf, 3.5 per cent power factor shunt capacitor and the above motor is 53.8 amperes at 115 volts, compared to 35 amperes locked rotor for the motor only. The power factor of the combined current is, however, 56.9 per cent leading, illustrating another important point, namely: substantial voltage dip improvement can be effected even with locked rotor currents considerably greater than those now in general use provided that these currents are at a sufficiently low leading power factor.

These considerations are further illustrated in Fig. 3 and in Table I. Fig. 3 is a voltage profile along the secondary from the source side of the distribution transformer, where the voltage is assumed to be held constant, to the motor terminals. For comparative purposes, the running voltage drop of the appliance is also plotted. In Table I, starting dips at leading power factor (items 9 to 16, inclusive) may be compared with those obtained by conventional methods of improving flicker voltages (items 2 to 8, inclusive), such as autotransformers, secondary banking, larger sizes of transformers and/or secondary copper, and shortening the length of the secondary by installing an additional transformer on the service pole. It will be noted that the improvement obtained by the leading power factor method is generally superior to that resulting from the conventional methods.

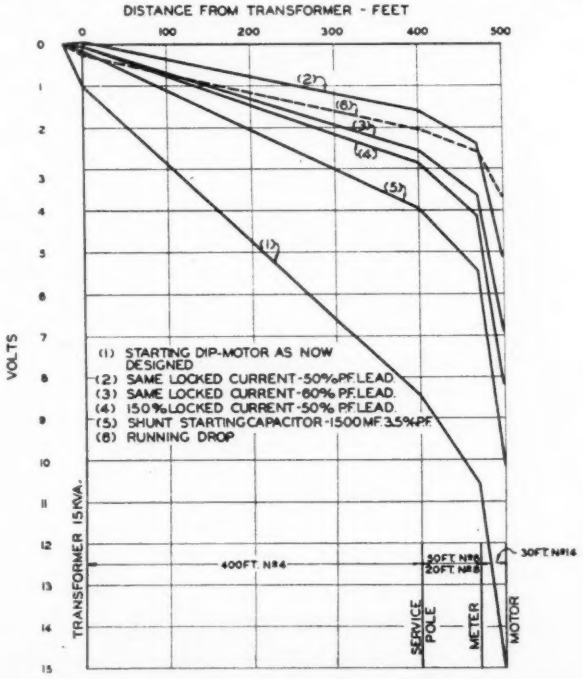


Fig. 3—Voltage Dip Profile—½-Hp Motor on Typical Transformer-Secondary Service Combination

The attention of appliance manufacturers — particularly those using the larger ratings of fractional horsepower motors with high starting torque requirements—is called to the marked improvement in voltage at the motor terminals. It is well known that locked rotor current is related to starting torque; if, as has often been stated, motor size is determined by starting torque available at the probable minimum motor voltage at which the appliance may be required to start, then the development proposed should have a distinct value in improving this situation. Thus a number of possibilities develop that should be of interest to such manufacturers but are beyond the scope of this presentation.

It should be pointed out that these same principles might be applied to 230-volt, single-phase motors and to those polyphase motors that are used on combined light and power secondary systems. However, present discussion is confined to the larger 115-volt, single-phase motors.

General Discussion

It is evident from a general study of which the above numerical example is illustrative, that significant reductions in troublesome motor starting voltage dips can be effected with leading power factor starting currents.

The question then arises as to how far the development should be carried. The final answer of course can be determined only by overall economics. For the purpose of initiating the development, it seems logical to relate motor starting voltage dips to the voltage drops resulting from the running currents of the devices and then, on the basis of such relationships, to make specific recommendations for the consideration of motor manufacturers.

In Fig. 3, it will be noted that with

Tables II, III and IV—Motor and Circuit Combinations Used for Analysis of Four Motors on Four Secondaries

Table II

MOTORS				
SIZE	LOCKED ROTOR		RUNNING	
HP	AMP	PF	AMP	PF
1/4	22.3	.855	4.92	.652
1/3	28.1	.855	5.75	.750
1/2	35.0	.810	8.20	.835
3/4	57.0	.720	12.90	.825

Table III

TRANSFORMER-SECONDARY-SERVICE					
COM-BINATION	TRANSFORMER	SECONDARY	SERVICE LOOP	SERVICE ENTRANCE	BRANCH CIRCUIT
A	25 KVA	400 ft No. 2	50 ft No. 6	20 ft No. 8	30 ft No. 14
B	15 "	" " " 4	" " " "	" " " "	" " " "
C	5 "	500 " " "	" " " "	" " " "	" " " "
D	3 "	" " " 6	" " " "	" " " "	" " " "

Table IV

TRANSFORMER-SECONDARY-SERVICE					
COM-BINATION	TRANSFORMER	SECONDARY	SERVICE LOOP	SERVICE ENTRANCE	BRANCH CIRCUIT
W	15 KVA	400 ft No. 4	NONE	NONE	NONE
X	" "	" " " "	20 ft No. 6	20 ft No. 8	10 ft No. 14
Y	" "	" " " "	50 " " "	" " " "	30 " " "
Z	" "	" " " "	100 " " "	30 " " 10	50 " " "

the present magnitude of locked rotor current at 50 per cent leading power factor, the resulting starting dip is less at the service pole and at the meter than the drop that will be produced by the running current of the device. Obviously the electric utility must be prepared to provide facilities adequate for the running drop, and there is no logic in requiring starting drops to be less than running drops.

Consequently, the recommendations contained herein are based on an analysis of the relation between starting drops and running drops at the service pole. For this purpose, four motors on four transformer-secondary combinations have been studied. Drops at the service pole have been chosen as the criterion because it is drop up to this point that affects *all* customers on the secondary. The four motors cover horsepower ratings of ¼, 1/3, ½, and ¾, and are believed to be typical of present-day motor designs; the four secondary combinations cover a range of transformer ratings and wire length and sizes so chosen as to present extreme as well as probable average conditions. Specific data on motor starting and running currents as well as on the transformer-secondary combinations used are given in Tables II and III. For simplification, the impedance between service pole and the motor has been held constant. Computed starting and running voltage drops at the service pole and their ratio are plotted in Fig. 4, the circuit arrangement in all cases being that shown in Fig. 1.

Of course, all motors of a given horsepower rating do not have the same running current; likewise, an appliance may have more than one motor or may have other current-consuming load for the running of which distribution capacity must be provided. Consequently, some may question the use of running voltage drops as being too much of a variable. However, there are so many variables to be found in industry-wide motor applications that no set of computations may cover them all. In this analysis, the running currents given for the ¼- and 1/3-hp motors are typical values for the motor alone; running currents for the ½- and ¾-hp motors include other running load, which accounts for the relatively low ratio of starting to running drops pictured in Fig. 4. Here again an attempt was made to include some extremes in arriving at more or less average conditions. In any event, the various means of securing leading power factors for the starting period have all been analyzed and compared in the same manner, so that they should appear in their proper order of relative effectiveness.

On the above basis, it was found that the four motors on the four transformer-secondary combinations produce starting voltage dips at the service pole ranging from 3.45 to 4.90 times the running voltage drop at the same location. The average ratio is 4.37. With this as a

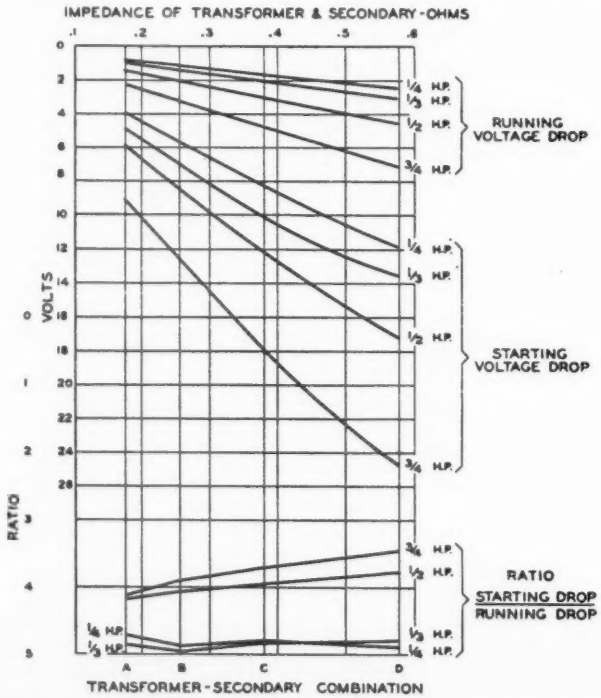


Fig. 4—Starting and Running Voltage Drops at Service Pole—Four 115-v Motors on 4 Transformer-Secondary Combinations

TABLE V—FOUR MOTORS ON FOUR TRANSFORMER-SECONDARY COMBINATIONS

AVERAGE RATIO $\frac{\text{STARTING VOLTAGE DROP}}{\text{RUNNING VOLTAGE DROP}}$ AT SERVICE POLE		
ITEM	DESCRIPTION	AVE. DROP RATIO
1	MOTORS AS NOW DESIGNED	4.37
2	MOTORS AS NOW DESIGNED WITH SHUNT STARTING CAPACITORS OF 10% PF. - MIXED MF. RATINGS	2.51
3	SAME AS 2, EXCEPT OTHER MIXED MF. RATINGS	2.48
4	SAME AS 2, EXCEPT MF. RATINGS TO GIVE LINE POWER FACTOR OF 50% LEADING	2.48
5	SAME AS 2, EXCEPT 1500 MF. WITH EACH MOTOR	2.43
6	MOTORS PRESENT LOCKED AMP @ 80% PF. LEADING	2.39
7	" 150% " " " 60% " "	2.20
8	MOTORS AS NOW DESIGNED WITH SHUNT STARTING CAPACITORS OF 3.5% PF. - MIXED MF. RATINGS	1.95
9	SAME AS 8, EXCEPT MF. RATINGS TO GIVE LINE POWER FACTOR OF 50% LEADING	1.92
10	SAME AS 8, EXCEPT 1500 MF. WITH EACH MOTOR	1.88
11	MOTORS PRESENT LOCKED AMP. @ 70% PF. LEADING	1.84
12	MOTORS AS NOW DESIGNED WITH SHUNT STARTING CAPACITOR OF 0% PF.-1500 MF. WITH EACH MOTOR	1.57
13	MOTORS 150% LOCKED AMP. @ 50% PF. LEADING	1.52
14	" PRESENT " " " 60% " "	1.33
15	" " " " " 50% " "	.83
16	" 150% " " " 40% " "	.82

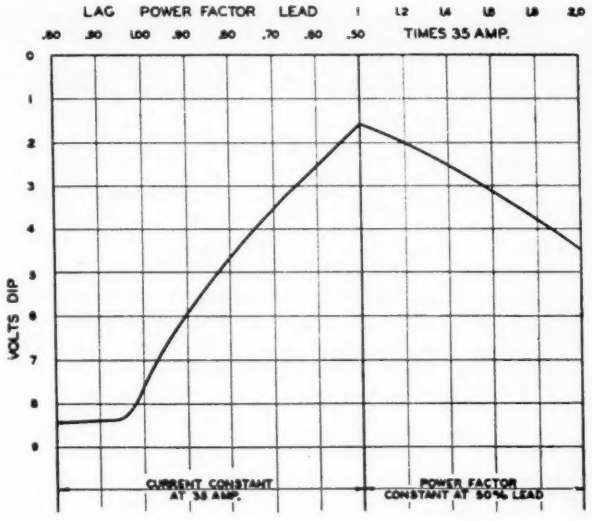


Fig. 5—Comparison of Voltage Dips at Service Pole—Present Value of Locked Rotor Current at Various Power Factors Vs. Larger Values of Locked Rotor Current at 50% Leading Power Factor—½-Hp Motor on Typical Transformer Secondary Service Combination

starting point, similar ratios have been computed for a number of conditions involving leading power factor starting currents. These ratios, arranged in descending magnitude, are given in Table V.

Examination of Table V indicates that if the four motors could have their present locked rotor currents at 50 per cent leading power faster, they would produce on the four transformer-secondary combinations starting dips at the service pole that average only 83 per cent (item 15) of the drops caused by the running currents of the devices they operate. Thus what is true for the ½-hp motor on the one transformer-secondary combination cited in the numerical example above, is found to be true for a range of conditions. Since starting dips less than running drops cannot be justified, it is apparent that the proposed new motor designs need not be carried to this extent. Further examination of Table V, however, shows that if these same locked rotor currents have a 60 per cent leading power factor (item 14), they will produce starting dips averaging 1.33 times the running drops. This condition, i.e., present magnitudes of locked rotor current at 60 per cent leading power factor, therefore lies in the area that should be investigated in the proposed motor designs.

As already mentioned, these studies have shown that locked rotor currents, if at a sufficiently low leading power factor, may exceed present values by a substantial margin and still produce smaller voltage dips than present magnitudes of current at present power factors. To illustrate this point further, Fig. 5 has been prepared using as an example the same ½-hp motor on the same transformer-secondary combination previously used for Fig. 2. In Fig. 5, service pole voltage dips are plotted for the present 35 amperes locked rotor current at various power factors down to 50 per cent leading, as well as voltage dips with up to twice 35 amperes at 50 per cent leading. It will be noted that 70 amperes at 50 per cent leading produces a voltage dip only about 53 per cent of that resulting from the present condition of 35 amperes at 81 per cent lagging power factor. At 150 per cent locked current at 50 per cent leading, the voltage dip is only about 34 per cent of the present value. As shown in Table V (item 13), an analysis of the four motors on the four transformer-secondary combinations indicates that motors having locked rotor currents of 150 per cent of present values at 50 per cent leading power factor will on the average produce starting voltage dips of 1.52 times running voltage drops. Thus the condition of locked rotor currents up to 150 per cent of present values at low leading power factors also lies in the area that should be investigated in the proposed motor designs.

The limits for such investigation must at this stage of the development be chosen more or less arbitrarily; it is suggested that, for the present, locked currents up to 150 per cent of present values at leading power factors that will under the conditions considered herein provide average drop ratios* between 1.00 and 1.50 be considered as justifying study by motor manufacturers.

Fig. 6 indicates more definitely the probable range of locked rotor currents and power factors that will meet the voltage drop ratio range specified. In Fig. 6, the average drop ratios of the four motors on the four transformer-secondary combinations are plotted for locked current ratios† of 1.0 and 1.5. It is seen that to attain average drop ratios between 1.00 and 1.50 leading power factors between about 53 per cent and 63 per cent are required if present values of locked rotor current can be retained; however, if locked rotor currents increase to 150 per cent of present values, the power factor range is from about 43 per cent to 50 per cent leading. These are the considerations that lead to the first two recommendations given at the beginning of this paper.

The third recommendation has to do with line starting capacitors applied at the motor terminals. As has already been indicated, the voltage dip improvement

*Drop ratio = $\frac{\text{starting voltage dip}}{\text{running voltage drop}}$

†Locked current ratio = $\frac{\text{locked rotor current of proposed arrangement}}{\text{locked rotor current of present motor}}$

AVERAGE DROP RATIO = AVERAGE $\frac{\text{STARTING DIP}}{\text{RUNNING DROP}}$ ON FOUR TRANSFORMER-SECONDARY COMBINATIONS

LCR = LOCKED CURRENT RATIO = $\frac{\text{LOCKED ROTOR CURRENT OF PROPOSED MOTORS}}{\text{LOCKED ROTOR CURRENT OF PRESENT MOTORS}}$

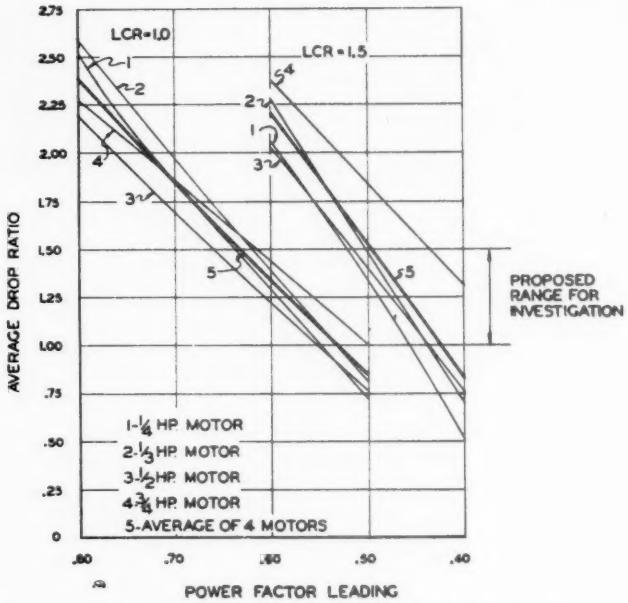


Fig. 6—Reduction in Average Drop Ratio with Locked Rotor Currents at Low Leading Power Factors

to be attained by this method is a function of the power factor of the capacitor. In the initial stages of this study, it was hoped that the inexpensive electrolytic capacitor now so widely used with capacitor-start motors would be satisfactory for this new application. This type of capacitor, however, has a power factor of 10 per cent or more, and as the study progressed it was found that its effectiveness lay mainly in the larger transformer and wire sizes. Consequently, the use of capacitors with lower power factors was examined, the study showing that, on the average, the shunt starting capacitor does not produce as good results as motors designed to meet the conditions mentioned above. For example, with a 1500-mf shunt capacitor, average drop ratios for the four motors on the four transformer-secondary combinations were found to be:

Power Factor of Capacitor	Average Drop Ratio
.000	1.57
.035	1.88
.100	2.43

All of these drop ratios are beyond the upper limit of 1.50 suggested above. In view of these limitations, it is apparent that higher drop ratios must be considered if starting capacitors are to be used.

In spite of these limitations, the line starting capacitor may find a field of usefulness because of the following advantages:

1. It might be made available as a separate device, with its own auxiliary switching equipment, all arranged in one package for installation close to the terminals of an existing motor whose starting flicker must be corrected;
2. It does not involve redesign of present-day motors;
3. It might serve as a somewhat less desirable substitute for the new motor designs already proposed in event that careful consideration shows such designs to have no economic future.

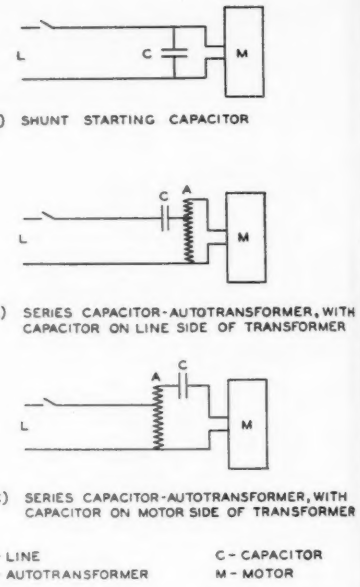


Fig. 7 — Various Arrangements of Line Starting Capacitors.

Consequently, for the present, it is suggested that motor manufacturers give consideration to line starting capacitors designed to give average drop ratios of 1.5 to 2.0. It appears that three alternatives in the application of line starting

(*Continued on page* 445)

AVERAGE DROP RATIO = AVERAGE $\frac{\text{STARTING DIP}}{\text{RUNNING DROP}}$ ON FOUR TRANSFORMER-SECONDARY COMBINATIONS.

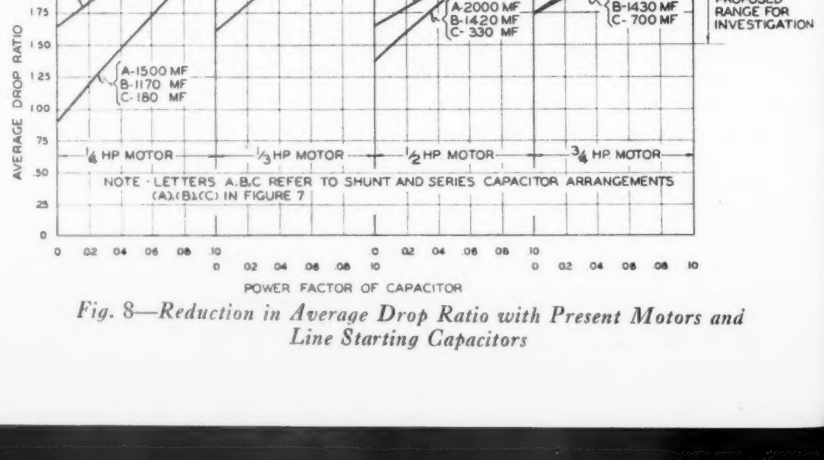

A-1000 MF B-760 MF C-270 MF
A-1500 MF B-1150 MF C-280 MF
A-1500 MF B-1030 MF C-440 MF
A-3000 MF B-1830 MF C-580 MF
A-2000 MF B-1110 MF C-870 MF
A-2000 MF B-1420 MF C-330 MF
A-2500 MF B-1430 MF C-700 MF
A-1500 MF B-1170 MF C-180 MF
PROPOSED RANGE FOR INVESTIGATION
¼ HP MOTOR
⅓ HP MOTOR
½ HP MOTOR
¾ HP MOTOR
NOTE - LETTERS A,B,C REFER TO SHUNT AND SERIES CAPACITOR ARRANGEMENTS (A),(B),(C) IN FIGURE 7
AVERAGE DROP RATIO
POWER FACTOR OF CAPACITOR

Fig. 8—Reduction in Average Drop Ratio with Present Motors and Line Starting Capacitors

What Farmers' Problems Are Still Unsolved?

By Orval C. French

Head, Department of Agricultural Engineering, Cornell University

An address before the Fifth National Farm Electrification Conference, St. Louis, Missouri, October 18, 1950

IN discussing as broad a subject as has been assigned me, one is likely to project his viewpoints and suggestions beyond that which may be practical or "professionally safe." In an agricultural industry which is as large and varied as that of the United States, it is certainly not my intention to even pretend that I have any unusual insight as to its basic problems or their likely solutions.

Industrial Progress Due to Excess of Farm Labor

In the development of this country there was very little industrial progress until an excess of farm labor was available. Prior to the introduction of a few simple machines and horses for power, there was very little time for anyone to devote his energy to other than producing food for himself. It was only a little over 100 years ago that it required the entire labor of one man to produce food for four others. Today one man can feed approximately 18 others. This release of farm labor has made possible the development of our American Industry and our present standard of living.

It appears to me that history clearly points out this country has always had "Agricultural Problems." If there had not been a problem it seems doubtful to me that progress would have resulted. Whatever has been the cause, it is clear that mechanical and biological improvements in agricultural production have resulted in a continuous reduction in the number of farm workers required. The reason farm labor has found its way into other industries is an economic attraction. Each time a farmer finds himself short of help he finds a method of doing his work without this extra help.

I have a strong conviction that any artificial means substituted for the free market solution to constantly arising "Agricultural Problems" will result in a neutralization of agricultural, as well as national progress.

Mechanization has been the key to industrial and agricultural development. This is not to argue that mechanization has solved all of the farmer's problems. Farming is too dynamic an enterprise to expect solutions to all problems. It is a highly competitive business as is evidenced by continued searching for methods to reduce unit production costs.

If one should be asked to state what the most universal problem in agriculture is, I believe the answer would have to be, "Increasing net income by means of reducing production costs." Obviously, this problem includes all of the farmer's specific problems. It may be attacked from the standpoint of increasing the production per man or from the standpoint of reducing the unit cost of production.

Some of my economist friends are very much concerned about the increased equipment investment costs that farmers are confronted with. I am frank to admit that I am concerned about them too, but I am not fearful that equipment investments are going to cause most farmers to go broke. Many of you can recall that similar fears were expressed thirty years ago when tractors and power equipment were being adopted rather widely.

Mechanization Brings Sociological Changes

The adoption of most new methods and equipment generally requires reorganization of any business, and widespread adoption invariably causes sociological changes. The result of the mechanization of agriculture has been to increase the farm size and to decrease the farm population. For a century some men have looked upon the machine with suspicion. If a machine could do the work of 10 men it would destroy jobs for 10 men. The results certainly do not bear this out. The adoption of machines simply hastened the development of additional "luxury" products, if you choose to define some of the products of industry made by excess farm labor as luxury items.

Mechanization has greatly stimulated the application of management methods and principles into farming. It is not sufficient to replace an obsolete machine with a new modern one without considering how the overall operations may need to be modified in order to properly amortize the new machine investment.

It seems to me that one of the most important problems that farmers have today is in the selection of the proper equipment, and of modifying or changing their operations so that this equipment can be used to reduce their production costs. Too often the equipment merely reduces the labor cost, but increased investment costs may leave overall production costs the same.

How Equipment Reduces Costs

Equipment can reduce costs if

1. It is well adapted to the job,
2. It can be used enough hours per year,
3. If its useful life is extended by careful servicing and maintenance.

There are very few tools that are equally well adapted to all farms. Different sizes of machines can not be economically built for all ranges of farm sizes. Hence, farm operations frequently need to be changed in order to use available equipment efficiently.

I have indicated earlier that a chronic problem of farmers is to maintain a reasonable net income. It appears that 1950 net incomes for U. S. farming will be about 10 per cent below 1949 and more than 25 per cent below 1947. Because urban workers' income is now at an all time high, I would expect an increasing number of farm workers to migrate to urban jobs in the immediate future. This will mean that a shortage of farm labor will develop and an increasing interest by farmers for additional and new labor saving equipment. If the military preparedness program progresses rapidly, an additional shortage of farm labor will materialize next year.

Where does electricity fit into this rapidly changing farm business? Fifteen years ago, about 10 per cent of the nation's farms were electrified. Today more than 85 per cent of our farms have power line service and a number of states have practically no farms without this form of power. As compared

to electrical power, man's labor is worth only about three cents per hour. Is it any wonder that farmers are seeking and utilizing electrical power in increasing amounts?

It appears to me that the development and extension of electric service to farms has been the largest single factor in bringing the living standards of farm families up to, and in many, many cases, higher than that of urban families.

Merely looking at statistics, one might conclude that the job of supplying electrical power to farmers is about finished. Such is not the case as I observe it. Many line extensions were installed for a very limited demand measured by present uses. Such lines will soon have to be rebuilt and their carrying capacity greatly increased. It seems very likely that many lines may have to be converted to three-phase service.

A high percentage of farm buildings in New York State, and I suspect in many other states, were wired for lights and very small power units. The job of rewiring for safe and efficient operation seems never to get completed.

The trend in the average annual electrical consumption on New York farms has been almost a straight-line increase during the past five years. It was approximately 2000 kwhr per year in 1945 and last year was 3400 kwhr. These figures are only indicative of the fact that farmers are making use of electricity at a rapidly increasing rate. It is my firm conviction that this trend will continue for a considerable time in the future.

Fifty Years of Progress

In 1951, New York State will celebrate the occasion of 50 years since establishment of the first rural power line in the state and we believe the first in the United States. A lot of progress has occurred during this period, but I sincerely believe we have made only a fair start.

An adequate wiring system for farms *is* and will continue to be a chronic problem for many years. If we could get more farmers aware of the inefficiencies and hazards of inadequate wiring, our rural electric contractors would be snowed under with work. Incidentally, there is a very big education job for someone in providing rural contractors with proper understanding of farm wiring requirements.

A much more effective job has been done in developing labor-saving equipment for field work than has been done around farm buildings. Those of us in the Northeastern States are perhaps more conscious of this fact because of the importance of dairying and poultry enterprises. For these two production enterprises an extremely high percentage of the labor requirements is spent in and around the buildings.

Investment in equipment for work in these buildings is very much less than for field equipment on such farms. A tremendous challenge exists for the development of labor-saving equipment for both dairy and poultry operations.

Let us take a look at what has been accomplished in recent years and also do a little "star gazing" for the future.

Recent Accomplishments

The milking machine has been an outstanding development for dairy farmers which really became accepted only after electricity was provided.

Improvements in milking methods are continually taking place, which is evidence to me that the ultimate has not been reached. Milking parlors are reducing the energy required by the operator. It makes for labor efficiency in that one man can handle more cows easier and generally faster. Pipe line milkers are eliminating the carrying of milk from the cow to its storage. Bulk cooling and storing of milk is eliminating all hand work and lifting of milk. The adoption of this method, however, hinges on a change in handling of milk from the farm to processing plant. Its widespread adoption will be limited until less costly equipment is developed or herd size is increased. Systems or methods of housing and handling dairy cattle are undergoing some changes. Loose housing has considerable merit from the standpoint of labor saving in feeding and milking and possible saving in housing costs. On the other hand, a large majority of dairymen are equipped with conventional-type structures which because of their permanence, investment, and other factors will continue to be used. We must, therefore, strive to mechanize some of the arduous chores in and around these structures.

The chore of feeding hay, silage, and concentrates to conventionally housed dairy cows has not been improved greatly over many years. True, silo unloaders are available, but farmers are not greatly impressed by most of these units. Self-feeding silos offer some possibility for loose housing systems. Baled hay has simplified the feeding of this roughage to a considerable extent.

In the harvesting, preservation, and storage of forage crops we have a real job ahead in reducing losses encountered in the field and storage as well as reducing handling costs.

One piece of equipment which will contribute a great deal to dairymen is a flexible conveyor-type elevator for silage and baled or chopped hay, driven by a relatively small electric motor. I am sure this machine will be developed. We are working on it at Cornell and so are some of our commercial friends. It is not a new idea, but the justification for its development is more urgent now than ever before.

Artificial drying of farm crops, particularly grains and forage, is receiving a great deal of attention and study. This is one of the most important contributions which can be made to agriculture. It appears that some partial solutions are at hand, but one cannot say the problem is finished until a much higher percentage of farmers are, or can, utilize the method.

Electrical heat, light, and power has meant much to poultry enterprises. Lighting has greatly increased egg production. Power and heating applications have made it possible for great improvement in labor efficiency. Automatic feeding, ventilation, brooding, watering and several other chores have been simplified.

New Poultry House Design

Some of us at Cornell are foolish enough to wonder if we can design poultry houses for the birds and not for the operator. As a result, we have started some studies on pens having 3-ft ceiling heights. Obviously, if this should prove practical, it will do so only with electrically operated ventilation, feeding, watering, lighting, egg collection and litter removal systems. We firmly believe that structure costs can be reduced and at the same time labor efficiency increased.

Considerable work is underway in various sections on open-pen type brooding by means of a combination of heat lamps and electric floor heat. This system has much in its favor and it may prove economical even though a standby power unit may be required. This latter requirement is not peculiar to electrical systems since other systems also require standby methods.

The field of farm processing and local marketing of many agricultural products is one in which electrical applications are highly essential and which

merits much more study. There seems to be little sense in poultry being purchased in New York State, shipped to Chicago and returned to Upstate New York markets in frozen form. A considerable number of poultrymen, both individually and in groups, are developing nice local markets for locally processed poultry.

Partial farm processing, such as grading of fruits as to both size and color by means of electronic controls, offers great challenges to the engineer, and some progress has been made in this direction. Grading of such products as processed fruits and vegetables by means of a mechanical color definer could result in tremendous savings to the processing industry and the farmer. As long as this grading has to be done by man's eyes, there will be wide variations and unavoidable losses will result.

Another farm problem which I never expect to see a complete solution for is that of pest control. We never have found more than a deterrent. Control of insects, diseases and weeds is an annual problem and we continually are faced with the application of poisons which may or may not create a residue problem. For many years, scientists have been searching for a light source and trap which will serve as an economical and safe control of insect pests. There are still possibilities that such a device can be devised. If it can be, it will surely be a blessing to humanity, but possibly a temporary headache for power companies.

The control of certain insects and bacteria by means of ultrasonic radiations is at present more than wishful thinking. It has not yet been proved, but there is considerable evidence some applications such as the treatment of water may be practical.

Some research workers believe that insects may eventually be controlled by means of electronic radiations. This field is so completely beyond my understanding that I hesitate to mention it. However, in the short space of one generation we have witnessed developments which at the start were as imaginative as this may appear to be now.

To date, the internal combustion engine powered tractor enjoys a monopoly for field uses. Is it beyond all reason to think that eventually someone may devise a battery or accumulator which may be a practical source of power for a tractor? Or that ultimately wireless transmission of power may be feasible? It sounds like comic book talk now, but so did Edison's ideas at one time.

The use of light radiation has had many farm applications some of which have been mentioned. Plant growth response to light is being commercially used to good advantage in florist crops. If we knew how to measure and control certain variables, perhaps certain lights and their application might solve some of our dairy cattle sterility problems.

While speaking of lights, I am certain that farm home and farmstead lighting problems have not been entirely solved. At least the job of installing effective lighting on farms has not been more than started.

One could spend more time than your patience would permit in pointing out possible future uses of electricity on farms. Frankly, I can't imagine what many of them may be ten years hence. I am reasonably sure, however, that farmers are going to increase their demands for power. Their demands will occur all the more rapidly when it is proved that the application will pay for itself.

The farmer should not have to serve as an experiment station for developing some of the products which he buys. More unified effort needs to be given toward the development of products which are offered for sale, particularly toward minimum standards and performance of new applications.

I wish to conclude by expressing my hope that there will always be "Farm Problems." When one problem is solved, another should develop. If such does not occur, then I believe progress will be at a standstill.

A New Method of Controlling Voltage Dips Caused by Motor Starting Currents

(*Continued from page* 442)

capacitors are possible: (A) a shunt capacitor connected across the motor terminals; (B) a series capacitor-autotransformer combination with the capacitor on the line side of transformer; and (C) a series capacitor-autotransformer combination with the capacitor on the motor side of the autotransformer. These arrangements, illustrated in Fig. 7, can be so proportioned as to give identical results insofar as voltage dip improvement and drop ratios are concerned (assuming a "perfect" autotransformer). Likewise, although microfarad ratings are different in the three arrangements, capacitor kv-a requirements are identical. It should perhaps be pointed out at this time that the straight series capacitor without an autotransformer has no application within the average drop ratio range of 1.5 to 2.0 proposed above.

Fig. 8 indicates more definitely capacitor requirements in meeting the proposed drop ratio range. It is seen that capacitor power factors of less than 4 per cent are necessary, with microfarad ratings ranging as follows:

Capacitor Arrangement	Microfarad Ratings
(A) Shunt capacitor	1000-3000
(B) Series capacitor-autotransformer, with capacitor on line side of transformer	760-1830
(C) Series capacitor-autotransformer, with capacitor on motor side of transformer	180- 870

These are the considerations that lead to the third recommendation given at the beginning of this paper.

What these proposals need now is sincere cooperative work by various branches of the electric power industry. It is hoped that this presentation will be of sufficient interest to other utility engineers for them to check the advantages of these objectives on their own systems; a consensus of such studies might lead to some desirable changes in them to the benefit of the entire industry. In particular, the study of these proposals by designers and manufacturers of motors and motor-driven appliances is earnestly solicited, to the end that fundamental economics may be carefully gaged to the mutual benefit of electric appliance users, electric appliance manufacturers, motor manufacturers, and electric public utilities. *If such study determines definitely that the proposals suggested herein are too costly when all factors are weighed, then somewhat higher average drop ratios should be given consideration in the search to find the proper economic balance between motor costs and cost to serve.* Figs. 6 and 8 might be used as a guide if such further studies are found necessary.

Better Light-Better Sight Bureau Offers New Lighting Educational Program— "Living With Light"

"LIVING WITH LIGHT," a new program of teaching materials for instruction in light and sight at the junior high school level, has just been made available for use in schools by the Better Light-Better Sight Bureau.

Intended to fill the needs for information on light and sight in the seventh, eighth and ninth grades, the program, it is expected, will find widest application in the science classes of junior high schools.

"Living with Light" includes a series of three film strips, with an average of 30 frames in each; six four-page study leaflets, for use by pupils; a teacher's guide, with detailed suggestions for the best use of the material, and a program book, to introduce the project to school administrators and principals.

Based on N.E.A. Manual

Based upon the instructional methods presented in the National Education Association's authoritative manual, "Teaching About Light and Sight," the new program also incorporates the advice and suggestions of numerous educational authorities. The National Science Teachers Association, a department of N.E.A., has provided extremely helpful guidance to the Bureau committee charged with preparation of the teaching materials.

Also put to good use in these teaching materials are many lessons learned through over two years' experience in hundreds of schools with the Bureau's first light-sight teaching activity for elementary schools, which has been presented to more than 200,000 school children in 39 states.

Role of Film Strips

The first of the three film strips is entitled "The World of Light and Sight." Designed to introduce the children to the basic relationship between light and sight, the film strip first gives some indication of the importance and complexity of the seeing process, with interesting examples taken from nature. The photographs and the continuity provided with the strip describe how modern civilization has increased the demands upon the eyes and point to the importance of light as a means of making seeing safer and easier.

"How to Be Bright About Light," the next film strip, illustrates and explains how glare, dimness, shadows and sharp contrasts in brightness present definite handicaps to comfortable seeing. The point that normal seeing is done by reflected light and the resulting need for properly directed light are stressed. In this film strip, students are also introduced to the measurement of light through the light meter, and are given a simple explanation of the footcandle.

"Light in the Working World," the third film strip, illustrates some of the scientific research into light and sight that has contributed to easier seeing, and shows how this work has resulted in better light for varied occupations and activities. The need for proper use of light, in work and at play, is emphasized.

The teacher's guide presents practical suggestions in the scheduling and use of the program, and will aid teachers to bring children along through the entire subject, from the simpler to the more complex points. Also included in the guide are lists of suggested class activities that can be used in each section of the program to clarify every phase; a review of the vocabulary used in the study leaflets; and ideas for research work that children can do, either individually or in small groups.

The "Living with Light" program will be offered to school authorities in complete packages designed for use with the average size class of about 40 pupils. A special introductory package will also be offered. Details are available upon request to the Better Light-Better Sight Bureau, 420 Lexington Ave., New York 17, N. Y.

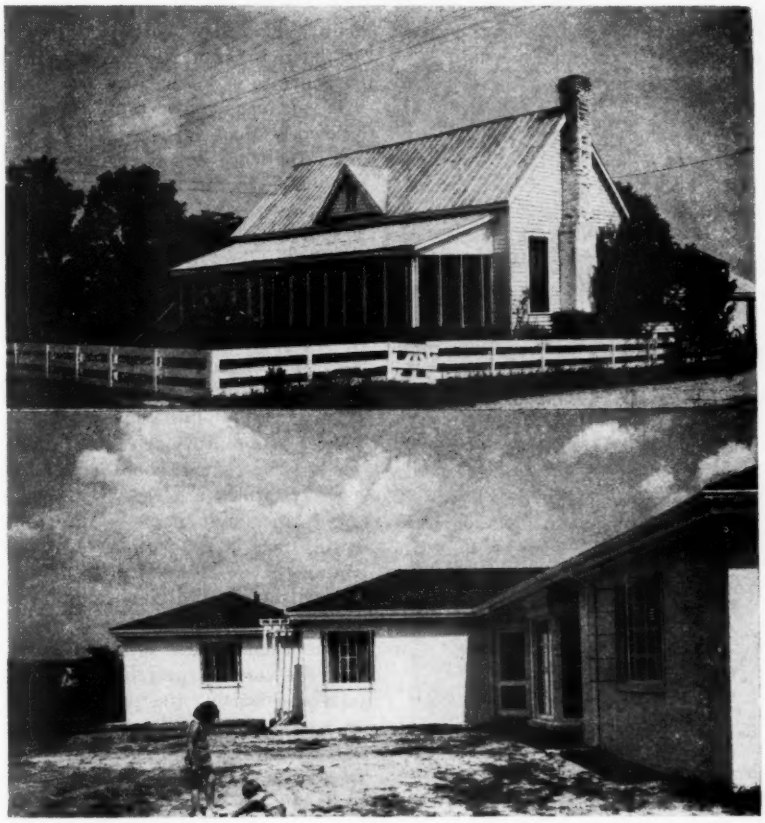
"Living With Light" Study leaflets (four of a series of six) prepared by the Better Light-Better Sight Bureau and aimed at lighting education for junior high school sudents.

Alabama Power Company's 125,000th Rural Customer Holds "Open House" Celebration

ON NOV. 7, near Prattsville, Ala., Mr. and Mrs. M. S. Murfee held "open house" for some of the officials of Alabama Power Company and others who had long been interested in rural electrification and improved farming practice.

The occasion for this "open house" was the fact that Mr. and Mrs. Murfee, on receiving service recently for the new home they built on their farm, learned that their farm was the 125 thousandth rural customer served by Alabama Power Company.

Among those present at the event were friends of the Murfees; L. M. Smith, vice-president and general manager and other officials of the Power Company; representatives of the U. S. Soil Conservation Service, and the state forestry service.



Top: The old Murfee homestead which contains many electrical conveniences. Bottom: The Murfee children playing in the yard of their new, completely electrified home.

Improved Farming Methods Show Profits

Mr. Murfee started farming on a rented farm of a little more than 200 acres about 16 years ago. In 1936 he bought his present farm on credit and in 1937 he began operating it. Since then, by following improved farming practice, he has almost paid for it. Asked to what he attributed his success in farming, Mr. Murfee said, "First I realized that I didn't know too much about it. I talked with successful farmers and followed their advice. I found that the Experiment Station of Alabama Polytechnic Institute, in their farm-size experiments, and smaller ones, had learned a lot of things about what could and couldn't be done profitably. I visited the farm Substations of the Institute and talked with the managers. I found that the county agent and other members of the Extension Service had much information that I could use profitably. The Soil Conservation Service also was of great service in helping me keep much of my farm from eroding and helping me with proper soil uses. Certainly the advice of the Alabama Power Company's rural service engineers was of great help in matters electrical."

Mr. Murfee, an energetic man, is not a front porch farmer. He devotes most of his daylight hours and some night time to the job. He is a careful record keeper. "Without records," he says, "you don't know where you've been or where you're headed, and certainly you can't tell which of your operations are profitable and which are unprofitable. Farming is a business," he says, "and you have got to run it like a business."

Like a business man, Mr. Murfee is a member of a number of associations related to the business of farming. Among the associations he belongs to are the Autauga Farm Bureau, Autauga Re-Seeding Crimson Clover Association, the Autauga Cattle Men's Association and the National Farm Loan Association. "Maybe you don't learn so much from the speeches made at association meetings," Mr. Murfee observes, "but by swapping experiences with the members present you certainly can get a lot of pointers to help you avoid making the mistakes the other fellow made."

Mr. & Mrs. Murfee who were married in 1941 have two daughters, Margaret 7 and Susan 4, and a 4-months old son.

At the time they were married they lived in the old farm home. Before building the new home this year, Mr. Murfee asked Mrs. Murfee, "Vivian, shall we build our new home on the farm or shall we build it in town?" To show you how delightful Mrs. Murfee has found life on the farm, she said, "I wouldn't think of having a home in town when it's so delightful living in the country." So the new home was built in a pasture approximately 1000 feet from the old homestead. The new home, of course, is completely electrified, but even before moving into it, Mrs. Murfee had many electrical conveniences in her old home. "We have all the conveniences of a home in town," she says, "and none of the inconveniences." Among the electric helpers she has are an electric refrig-

erator, range, water heater, dish washer, freezer, home laundry and many small appliances, all in an attractive kitchen of modern design. The Murfee home is centrally heated, with oil as a fuel. Air is circulated by means of a blower driven by an electric motor. Water is supplied by an artesian well, and an electric water pump to provide adequate pressure.

Electrical conveniences are not confined to the Murfee home. On the Murfee farm there are approximately 30 tenants. Each of their homes is wired and in addition to lights, each has at least a radio and an electric iron. Conversations with the tenants indicate the fact that "Mr. Murfee sho is a good man to work for"; the convenience of electricity plays a large part in their staying on year after year. All of the tenants are negroes and each has his own garden, chickens, etc. They do not work on a share cropper basis, but for wages.

The competent farm superintendent, Mr. J. Raymond Jones, resides in the old Murfee home. He, too, is a man who wasn't too familiar with modern farming practices, but "I was willing to learn," he says. He has been with Mr. Murfee for three years.

Combines Proven Practices with Mechanization

It would seem that the secret of Mr. Murfee's success has been his willingness to try out proven practices, to change crops as conditions seemed to indicate and to adapt what he grows to the conditions on his farm, rather than grow primarily those things he likes to grow.

There are ten different major soil types on the Murfee farm. During the current year 225 acres are in cotton, 150 acres in corn and 60 acres in soy beans. Clover is grown for seed on 500 acres and the balance is in pasture and woodlands.

At present he has 300 head of beef cattle and expects to increase this. The only other livestock on the Murfee farm consists of four horses, ten mules, and chickens to supply the family and tenants with eggs and fried chicken.

Mr. Murfee believes in mechanization for efficient farming. He has eight tractors and diesel caterpillar with bulldozer pan. All are of the same make (except the caterpillar) so that parts are interchangeable. Thus, if two should get out of order at the same time he can usually get one of them to running in quick time by taking a part from the other, so only one tractor is out of service while awaiting the arrival of the necessary repair part. Among tools in the farm shop are a forge, for which an electric blower supplies the draft, an electric welder, bench grinders and other electrical hand tools. Says Mr. Murfee, "We are proud of our electricity and happy that it is Alabama Power electricity."

L. M. Smith, vice-president and general manager of Alabama Power Company, remarked: "This occasion is one of the most appreciated that has ever happened to us. Our Company has been honored many times, but never more graciously than this. It is an entirely new experience and it represents a distinct and separate page in our history. We appreciate being asked to your home, Mr. Murfee, and are grateful for the nice things you say about us.

Extension of Rural Lines

"Our Company is committed to the ideal of doing our part in the development of Alabama," Mr. Smith said. "We began our rural line work more than a quarter of a century ago because we felt that the rural areas should have the conveniences which electricity was bringing to the cities and towns. With the help of the Experiment Station and the Extension Service at Auburn we developed data on the practical application of electric service to farm jobs. Our engineers produced construction specifications to reduce the cost of rural lines without in anywise impairing the reliability of the service. Rates, commensurate with line costs but low enough to permit electricity to "pay its way" on the farm, were devised. Following these studies and experiments our rural line program was then launched. We feel that we have carried out the great public responsibility which this program imposed upon us.

"A business depression and a great war interfered with and practically stopped our program at times. However, by the beginning of World War II we had built 9,197 miles of rural lines to serve 50,582 customers. During the war years our program was restricted, but we built a total of 371 miles of rural lines. Since the end of the war we have built an additional 11,000 miles of line to serve 67,000 rural customers. This home was connected to our lines in late June of this year and was the 125,000th rural customer so served.

"This program, along with the necessary generation and transmission facilities represents many millions of dollars of physical property on which we pay annual property taxes. These property taxes are in addition to other state taxes such as income tax, kilowatthour tax, et cetera, and federal taxes. Our total tax bill this year will approximate $10,000,000, of which almost ¾ million dollars, will be earmarked for the schools of Alabama. We are evidently carrying our part of the tax load.

"As we continue to add facilities to adequately serve our present and future customers, and still have reserve capacity sufficient to care for unusual demands upon our system, the tax bill will continue to rise. We expect to spend approximately 63½ million dollars during 1950-'51 and '52 for additions and improvements. We anticipate that our power requirements will double during the decade 1950-1960; and we are providing new power plants to the end of meeting this large increase. Thus we will continue to give our service area an ample supply of power, at rates which are as low as is consistent with good service. This is our pledge to you and to all of our other customers.

"Again let me thank you for this thoughtful expression on your part and to say to Mrs. Murfee that, at the risk of violating her hospitality, we have "peeped" into her kitchen. Our peeping indicated that she does not have certain appliances, and we wish to present her with this appliance package as a token of our appreciation of her kindness to us on this occasion."

A Milestone in Rural Living

P. O. Davis, director, Alabama Extension Service, said: "This is a 'milestone' event in farm life and rural living in Alabama. It is being staged at No. 125,000 in the Alabama Power Company's rural line of service that has lifted burdens, enriched living, and created wealth.

"As one who was present back in the twenties at the dedication of the initial rural line by the Alabama Power Company, I am honored and pleased to be here as a representative of the Extension Service of the Alabama Polytechnic Institute and call attention to some of the economic aspects of rural electrification.

"The substitution of kilowatt-hours for man-hours and mule-hours in the operation of a farm," he said, "is a direct contribution to the attractiveness, comfort, and convenience of farm life. Also, it can—and does—reduce the cost of many farm jobs and it can—and does—increase production.

"Either of these adds to the profit of the farmer, enlarges the rural market for a variety of consumer goods, and improves the economic level of the entire area.

"A few examples: in the drying and

(*Continued on page* 450)

"Range of the Stars" Promotion Program Sponsored by EEI Features Eight Hollywood Stars

"THE RANGE OF THE STARS" is a slogan which will soon be familiar to millions of electricity users across the nation. It highlights the new EEI sponsored program for the promotion of electric ranges which will carry the endorsement of eight of Hollywood's top stars.

Mr. and Mrs. Gene Autry

Mr. and Mrs. Jack Benny

Mr. and Mrs. Eddie Cantor

Mr. and Mrs. Broderick Crawford

Stars' Wives Approve Electric Cooking

Bob Hope, Jack Benny, Eddie Cantor, Broderick Crawford, Alan Ladd, Pat O'Brien, Gene Autry, and Robert Young are the stars whose names will headline the program. But of equal importance to American housewives is the enthusiastic approval of electric cooking given by the wives of these famous personalities.

The program was developed by the EEI Electric Kitchen and Laundry Committee, directed by Chairman Will T. Clark of The Cleveland Electric Illuminating Company, in conjunction with the Ralph Jones Advertising Agency, and a wide range of promotional material has been prepared.

"How to Hold a Star"

The program centers around a colorfully printed 12-page booklet entitled *How to Hold a Star,* which features the favorite recipe of each star, as prepared by his wife. The booklet is highlighted by photographs of the eight couples taken in their own electric kitchens.

Newspaper advertising will play an important part in the campaign. Eight advertisements have been developed, each featuring a recipe and photograph of one of the stars and his wife. Four of the ads are in mat form for use in either three or four column sizes. The other four are in layout form and provide sufficient material for individual companies to make up any size ad desired. Provision has also been made for campaign publicity, and glossy prints of the stars with explanatory captions are obtainable for release to newspapers.

Moreover, the campaign proposes to tap the vast consumer market served by radio and television. Twenty-four spot radio commercials have been prepared

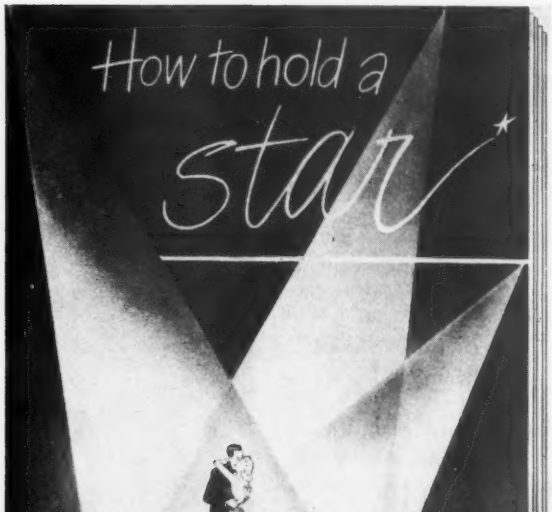
Pictured on this page in alphabetical order are the eight Hollywood stars participating in the "Range of the Stars" program. These photographs, taken in the stars' own kitchens, will be used for newspaper and publicity releases.

Mr. and Mrs. Bob Hope

Mr. and Mrs. Alan Ladd

Mr. and Mrs. Pat O'Brien

Mr. and Mrs. Robert Young



This attractive 12-page booklet, about which the "Range of the Stars" Program centers, contains the favorite recipe of each star.

in lengths varying from 15 seconds to a full minute. Eight television scripts in 20-second to full-minute lengths are available, along with matte photographs of Jack Benny, Gene Autry, and Eddie Cantor which may be used in front of the television camera. The scripts are suitable for spot commercials or for integration in a company's present television show.

Display Advertising

Display advertising has not been neglected. Four star-shaped cutouts and four easel-backed display cards, each featuring a photograph of one of the stars, are available for window, showroom and counter displays. Included also is a large colorful streamer, designed primarily for window or showroom use.

Large Potential Market

The customer lists of companies provide another large potential market. In line with this, a small color folder featuring Bob Hope has been prepared for use as a bill or correspondence enclosure. It may also be used for over-the-counter distribution or as a door-opener for salesmen.

During the last 10 years, sales of electric ranges have been quadrupled and the number of ranges in service more than tripled. Range sales in 1950 are expected to climb to a record peak of 1,800,000 whereas sales in 1940 totaled 450,000. The number of ranges in service by the end of 1950, according to *Electrical Merchandising Magazine*, will total 8,195,000, an impressive increase over the 1940 total of 2,510,000. These figures indicate the growing popularity of electric cooking.

Star's Favorite Recipes Featured

The "Range of the Stars" program is so directed that it will attract the attention of a large consumer audience. By capitalizing on the interest surrounding Hollywood personalities, offering useful recipes, and presenting reasoned advertising copy, the campaign should invite widespread attention.

Further information about "The Range of the Stars" program may be had from the Commercial Department, Edison Electric Institute, 420 Lexington Avenue, New York 17, New York.

Wisconsin Utilities Association Gas & Electric Convention

(*Continued from page* 432)

concluded the convention. Accomplishments during the year were outlined by each of the chairmen of the section's seven committees.

A symposium was conducted at this session on "Workable Sales Ideas" in which sales managers of the association's member companies contributed their own versions of sales and service problems and the steps taken to solve them.

Principal speakers for the sales and service session included: W. W. Blish, chairman of the association's Advertising Committee; A. L. Nelson, sales manager, Roth Appliance Distributors; A. G. Bur, sales manager, Wisconsin Public Service Corp.; A. A. Pfingsten, chairman, Farm Sales Committee; Miss Mildred Morford, chairman, Home Service Committee; and Mrs. Vera B. Ellwood, Wisconsin Electric Power Co.

Alabama Power Co.'s 125,000th Rural Customer

(*Continued from page* 448)

cleaning of seed, in the preparation of feeds, in the incubation and brooding of chickens, in cooling milk, in the refrigeration of food, and in the operation of a farm shop, electricity has many well-known applications.

"Electricity is applicable to more than 200 different farm operations," Mr. Davis added. "It is serving, for example, this family at whose home we are now meeting, as well as, or better than a dozen human slaves served kings and queens of old. And it serves in many ways unknown and impossible to them.

"Its availability is, therefore, a must in modern agricultural enterprises. Any doubt on this can be removed quickly by asking any farmer or farm woman who has it after not having it.

"Electricity has been found by other major industries to be adaptable to their requirements of economy, cleanliness, safety and easy control. But agricultural industry is just now beginning to fully realize these possibilities. There is every reason to expect a rapid increase in the use of electricity for farming operations as well as better rural living.

"It is a real pleasure to be present at this occasion which specifically recognizes the splendid contribution which the Alabama Power Company has made to rural electrification in Alabama. Farming is richer and living is better wherever the power lines of this company have gone. Therefore, I wish them more success in the future."

EEI PUBLICATIONS AND SERVICE MATERIAL

(Prices include transportation in U. S. only. Please order by number shown before title. Standing Orders may be placed for a specified number of copies of reports of various committees as issued, to be shipped to one address.)

Payable in United States Currency—Postage Stamps Not Acceptable

Accounting and Statistical

	Members	Non-Members
Conference Proceedings (Bound Volume) 1950	$2.00	$2.00
Conference Proceedings (Bound Volume) 1949	2.00	2.00
Conference Proceedings Previous Years*		

*The "Proceedings" of Joint Accounting Conferences of Edison Electric Institute and American Gas Association include a great many reports, papers and studies on a wide variety of subjects of interest to electric and gas utility accountants. Most of these reports and papers are not available as individual documents, but copies of the proceedings listed above, or sections thereof, can still be obtained. A request for a specific report or paper known to have been presented at one of the above conferences can often be met.

Simulated Federal Income Tax Return, 1947	1.00	1.00
Customer Accounting Practices and Policies, 1946	1.00	1.00
Summary of Definitions Covering Depreciation and Related Terms, 1939	1.00	1.15
Statistical		
50-2—Electric Light and Power Industry, 1949 (1950)	.30	.75
R-2—Electric Light and Power Industry, 1948 (1949)	**.30**	**.75**
Q2—Electric Light and Power Industry, 1947 (1948)	.30	.75
P-2—Electric Light and Power Industry 1946 (1947)	.30	.75
O-2—Electric Light and Power Industry 1945 (1946)	.30	.75
M-2—Electric Light and Power Industry, 1944 (1945)	.30	.85
L-2—Electric Light and Power Industry in 1943 (1944)	.30	.75
K-2—Electric Light and Power Industry in 1942 (6/43)	.30	.75
J-2—Electric Light and Power Industry in 1941 (5/42)	.30	.75
(Statistical Bulletins also available for years 1932 to 1940 inclusive) each.	.30	.75
Weekly, Monthly and Annual Statistics (Includes Annual Statistical Bulletin; Weekly Electric Power output; Monthly Electrical Research Statistics).	2.00	2.00

Engineering Committees

ACCIDENT PREVENTION—RESUSCITATION

P-9—Application and Care of Rubber Protective Equipment, 1948	.25	.25
100-499 copies, 15% discount		
500 or more copies, 25% discount		
O-15—Use and Care of Pole Climbing Equipment, 1946	.25	.25
M-10—Fifteen Messages on Accident Prevention in Electric Utilities	.10	.10
L-4—Linemen Cutouts (2/45)	.10	
K-8—Pole Top Resuscitation (9/43).	.10	
(Quantity Prices on Application)		
J-9—1941 Accident Statistics of Electric Light & Power Industry (12/42)	.10	.25
E-12—Resuscitation Booklets (11/47) 1— 9 copies	.15 each	
10— 99 copies	.10 each	
100—499 copies	.08 each	

ELECTRICAL EQUIPMENT COMMITTEE

50-7—Specifications for Alternating Current Power Circuit Breakers (2nd Edition) AEIC—1950	.60	.60
M-15—Recommended Safety Practices for Electrical Metermen Single copies	.25	
10 to 49 copies	.20	
50 to 99 copies	.18	
100 or more copies	.15	
M-3—Principles of System Relaying (1945)	.60	1.50
J-8—Utilization Voltage Standardization Recommendations 1942	.20	.50
F-13—Reconditioning Flood Damaged Electrical Equipment (12/38)	.30	.75
F-5—Design of Switchhouses for Generating Stations and Transmission Substations (6/38)	.40	1.00

HYDRAULIC POWER COMMITTEE

D-15—Penstocks (12/35)	1.00	2.50
A-19—Hydraulic Governors (8/33)	.20	.50

JOINT REPORTS

	Members	Non-Members
R-9—Branch Circuit Overcurrent Protection for Low-Voltage Circuits of 30 Amperes or Less Used for Interior Wiring—Report of Joint Committee on Branch Circuit Protection of AEIC & EEI, 1949	1.00	1.00
R-6—Preferred Voltage Ratings for A-C Systems & Equipment, EEI—NEMA (1949)	.70	.90
Q-8—Single - Phase Motor Starting Current Rules, EEI-NEMA-AEIC, 1948	.25	.25
Q-4—Guide for Specification on Indoor Metalclad Switchgear, AEIC-EEI-NEMA, 1948	.25	.25
Q-3 — Standards for Distribution Transformers (Fourth Report), EEI-NEMA, 1948	.80	1.00
P-1—Mutual Assistance in General Emergency Situations Affecting both Power & Telephone Service—Report of Joint Subcommittee on Cooperation in Emergencies, EEI and Bell Telephone System	No charge	
O-12—Report of Joint Engineering Committee of Association of American Railroads & EEI on Crossings of Electrical Supply Lines and Facilities of Steam and Electrified Railroads (8/46)	.50	
Quantities of 25 or more	.40	
O-11—Mutual Practices Applying to Installation and Maintenance of Equipment Used in Providing Telephone Service by Power Line Carrier in Rural Areas (For Field Trial)—Report of Joint Committee on Plant Coordination of EEI and Bell Telephone System	No charge	
O-10—Interim Report of EEI-NEMA Joint Committee on Preferred Voltage Ratings for A-C Systems and Equipment (11/46)	.50	.70
O-5 — Standards for Distribution Transformers (Third Report) EEI-NEMA (6/46)	.50	.70
M-12—Joint Pole Practices for Supply and Communication Circuits—EEI-Bell Telephone (1945)	.50	1.25
M-9—New Developments in Office Machines — Joint AGA-EEI Customer Accounting Committee Report	.50	.50
M-5—Principles and Practices for Inductive Coordination, Allocation of Costs and Joint Use of Poles—EEI-Bell Telephone (1945)	No charge	
I-9 — Standards for Distribution Transformers (Second Report—Revised) EEI-NEMA (1945)	25. .60	.70
L-5—Interim Report of The American Research Committee on Grounding (1/44)	.10	
K-1—Volume 5 of Engineering Reports Nos. 39 to 49 of Joint Subcommittee on Development and Research (1/43)	5.00	10.00
J-8—Utilization Voltage Standardization Recommendations (10/42)	.20	.50
J-6—Wave Shape of Multi-Phase Rectifiers—Engr. Report No. 49—Joint Subcommittee on Development and Research (8/42)	.50	1.25
J-4—Low Frequency Shielding in Telephone Cables—Engineering Report No. 48—Joint Subcommittee on Development and Research (5/42).	.80	2.00
J-1—Positive Disconnection of Distribution Circuits During Faults to Ground—Engineering Report No. 47—Joint Subcommittee on Development and Research (4/42)	.60	1.50
I-9—Standards for Distribution Transformers (Second Report) EEI-NEMA (12/41)	.25	.60
I-8—Susceptiveness of Subscriber Station Sets—Engineering Report No. 46—Joint Subcommittee on Development and Research (12/41)	.60	1.50
I-7—Frequency Weighting for Message Circuit Noise — Engineering Report No. 45—Joint Subcommittee on Development and Research (12/41)	.20	.50
H-12—Neutralizing Transformers — Engineering Report No. 44—Joint Subcommittee on Development and Research (7/41)	.30	.75
H-10—Effects of Bonding Exchange Aerial Telephone Cable Sheaths to Multi-Grounded Power Neutrals—Engineering Report No. 43—Joint Subcommittee on Development and Research (6/41)	.30	.75
H-8—Standard Basic Impulse Installation Levels — AIEE-EEI-NEMA (1/41)	.05	.05
H-3—Inductive Coordination Aspects of Petersen Coil Grounding—Engr. Report No. 42—Joint Subcommittee on Development and Research (12/40)	.25	.65
H-1—Test Specifications for Household Electric Ranges—EEI-NEMA (5/40)	.20	.50
G-9—Methods of Measuring Radio Noise—EEI-NEMA-RMA (2/40)	.20	.50
F-17—Short - Circuiting Relay Protectors—Engr. Report No. 41—Joint Subcommittee on Development and Research (8/38)	.40	1.00
F-8—Test Specifications Automatic Electric Storage Water Heaters—EEI-NEMA (10/38)	.20	.50
F-2—Inductive Coordination of Rural Power and Telephone Systems—Engr. Report No. 40—Joint Subcommittee on Development and Research (1/38)	.80	2.00

PRIME MOVERS COMMITTEE

50-1—Turbine & Condensers and Associated Equipment, 1948 (1950)	1.00	2.50
R-13—Turbine and Boiler Overhaul Practice (1949)	.50	1.25
R-8—Boiler Auxiliaries, 1948	.30	.75
R-7—Metallurgy and Piping, 1948	.60	1.50
R-3—Turbines, Condensers & Auxiliaries Feedwater Heaters & Evaporators, 1946-47 (1949)	1.40	3.50
R-1—Boilers & Combustion, 1948 (1949)	1.00	2.50
P-10—Boiler Auxiliaries, 1946-1947	.70	1.75
P-8—Turbines, Condensers, and Their Auxiliaries, 1945-1946	1.00	2.50
P-4—Metallurgy and Piping, 1947 (9/47)	.60	1.50
O-13—Boilers and Combustion, 1946	1.00	2.50
M-6—Boiler Auxiliaries, 1944-45	.70	1.75
M-4—Boilers and Combustion, 1944	1.00	2.50
L-3 — Turbines Condensers, Feedwater Heaters, 1943-44	1.00	2.50
K-7 — Turbines, Condensers, Feedwater Heaters, 1942 (9/43)	.25	.65
K-3—Furnace Tube Corrosion (3/43)	.20	.50
K-5—Turbine Operation Data (6/43)	.30	.75
J-7—Boilers and Combustion, 1941 (10/42)	1.20	3.00
I-6—Metallurgy and Piping, 1940 (12/41)	.70	1.75
I-4 — Boiler Auxiliaries, 1940-41 (10/41)	.90	2.00
H-11—Power Station Chemistry, 1940 (7/41)	.40	1.00
H-9—Turbines, Condensers and Associated Equipment (4/41)	.80	2.00
H-7 — Boilers — Combustion, 1940 (3/42)	1.60	4.00
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G-3—Combustion, 1939 (12/39)	.80	2.00
F-15—Boilers, Superheaters, Economizers, Air Heaters and Piping, 1938 (12/38)	1.00	2.50
F-14 — Turbines, Condensers and Pumps, 1938 (12/38)	.70	1.75
F-12—Combustion, 1938 (11/38)	1.00	2.50

TRANSMISSION AND DISTRIBUTION COMMITTEE

50-3—Cable Operation, 1947 (1950)	.75	1.75
Q-12—A-C Network Operations, 1944-1946 (1949)	.60	1.50
Q-10—Cable Operation Report, 1946.	$ .75	$1.75
Q-1—Cable Operation Report, 1945.	.75	1.75
O-14—Cable Operation Report, 1944	.60	1.50
M-16—Cable Operation Report, 1943	.50	1.25
M-1—A-C Network Operations, 1941-1943 (1943)	.60	1.50 1.65
L-1—Cable Operation—1942 (12/44).	.50	1.25
K-10—Line Clearing Manual, 1944 1-9 copies		35c.
K-6—Cable Operation — 1941 General (9/43)	.50	1.25 1.35
K-4—A-C Network Operations, 1938-1940 (4/43)	.60	1.50 1.60
J-5—Ice and Wind Loading Tables for Overhead Line Conductors (Revision of Tables 85 to 96 of the Overhead Systems Reference Book) 1942	1-4 copies	10c.
J-3—Cable Operation, 1940 (8/42)	.50	1.25
H-6—Distribution Transformer Load Supervision (3/41)	.60	1.50
H-5—Cable Operations, 1939 (1/41).	.60	1.50
G-5—Cable Operation, 1938 (1/40)	.60	1.50
G-1—A.C. Network Operation, 1936-1937 (8/39)	.80	2.00
F-16—Cable Operation, 1937 (12/38)	.60	1.50
F-10 — Tree Trimming Practices (10/38)	.20	.50
F-9—Conductor Sags and Tension for Rural Lines (10/38)	.40	1.00

SUGGESTIONS FOR SPECIFICATIONS

10 to 49 copies, 25% discount
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	Members	Non-Members
MS-1—Suggestions for Specifications for Standard Dial Constants for Alternating Current Watthour Meters (8/40)	.10	.10
MS-2—Suggestions for Specificaitons for Coordinated and Standardized Low Voltage Metering Current Transformers (8/40)	.10	.10
MS-3 — Specifications for Standard Current Transformers for Primary Circuits (8/42)	.10	.10
MS-4—Specifications for Indicating and Cumulative Demand Register Scales (8/42)	.10	.10
MS-5—Specifications for Indicating Thermal Watt Demand Meters, 1946	.10	.10
MS-6—Specifications for Marking and Arrangement of Terminals for Phase-Shifting Devices Used in Metering, 1946	.10	.10
MSJ-7—AEIC-EEI-NEMA Standards for Watthour Meter Sockets, 1950.	1.25	1.25
TD-1—Specifications for Steel Bolts and Nuts Supersedes TD-1, 1937 (1949)	.10	.10
TD-2—Suggestions for Specifications for Strand Eye Anchor Rods (5/42)	.10	.10
TD-3—Suggestions for Specifications for Lag Screws (10/38)	.10	.10
TD-4—Suggestions for Specifications for Eye Bolts (6/39)	.10	.10
TD-5—Suggestions for Specifications for Evenuts and Eyelets (4/41)	.10	.10
TD-6—Suggestions for Specifications for Steel Crossarm Braces (5/40)	.10	.10
TD-7—Specifications for Spool Type Secondary Racks (1948)	.10	.10
TD-8—Suggestions for Specifications for Straight Tinned Copper Connectors (10/40)	.10	.10
TD-9—Specifications for Single Tube Seamless Copper Splicing Sleeves (10/42)	.10	.10
TD-10—Suggestions for Specifications for Rolled Steel Washers (5/40)	.10	.10
TD-12—Specifications for Pole Guards, 1946	.10	.10
TD-15—Specifications for Pole and Lower Steps, 1946	.10	.10
TD-17—Specifications for Bolt Type Steel Insulator Pins with One Inch Diameter Lead Threads, 1947	.10	.10
TD-51—Specifications for Low and Medium Voltage Pin Type Lime-Glass Insulators (Supersedes TD-51, 1937 in part) 1942	.25	.25
TD-51—Suggestions for Specifications for Low and Medium Voltage Pin-Type Lime-Glass Insulators (2/43)	.25	.25
TD-61—Suggestions for Specifications for Type "A" Untreated Douglas Fir Crossarms (11/40)	.10	.10
TD-62—Suggestions for Specifications for Type "B" Untreated Douglas Fir Crossarms (11/40)	.10	.10
TD-71—Suggestions for Specifications for Insulator and Pin Threads and Gauges (5/37)	.10	.10
TD-72 — Tentative Specification for Line Connectors and Splices (1949)	.10	.10
TD-90—Specifications for Douglas Fir Crossarm Treated or Untreated, 1950	.10	.10
TDJ-19—Standard Mounting Bracket for Distribution Cutouts and Distribution Lightning Arresters (1949)	.10	.10

General Commercial Committees

	Members	Non-Members
Agriculture		
P-7—Utility Farm Promotion, 1947.	$ .40	$ .50
In-Service Training Program for Agricultural Workers	1.50	1.50
Farm Electrification Manual	5.00	8.00
Suggestions on Agricultural Development for Electric Companies	3.50	3.50
General		
50-5—Study to Determine Load and Revenue Potential of the American Restaurant, 1950	.25	.25
R-19—Catalogue of Sales Aids for Electric Industry, 1949	1.00	2.00
R-10—Study to Determine Load and Revenue Potential of American Drug Store, 1949	.25	.25
P-6—The Heat Pump (7/47)	.25	.25
P-5—A Guide for the Selection of Sales Personnel	.75	.75
Analysis and Development of Commercial Market	.50	1.00
Directory of Manufacturing of Commercial and Small Industrial Equipment (6/46)	1.00	1.50
O-16—Position Descriptions for Eight Utility Sales Jobs (12/46)	.35	.35
O-6—Commercial Refrigeration, 1946.	.25	.25
O-3—Sales Personnel Practices of Utility Commercial Sales Department, 1946	.40	1.00
O-1—Salesmen's Reminder, 1946	.25	.25
M-11—Report of Sales Personnel Committee (10/45)	.35	.35
M-14—Home Service Suggestions for organizing and operating Home Service Departments of Electric Companies	.40	1.00
Lighting		
R-18—Tabulation of Information Relating to Street Lighting As Obtained from Returns of 104 Public Utility Companies Throughout the U S, 1949	.40	.40
Q-9—Tabulation of Information Relating to Street Lighting as Obtained from Returns of 39 Public Utility Companies Throughout the U S, 1948	.40	.40
O-9—Utility Home Lighting Promotion, 1946	.40	.40
O-8—A Comparison of Conventional Hot Cathode and Cold Cathode Tubing Fluorescent Light Sources, 1946	.25	.25
Power		
I-1—Power Sales Manual—Sections 1 to 10 and 12 to 17 and Supplements to Jan. 1, 1950 (Includes one Binder)	Prices Upon Request	
G-4—Electric Metal-Melting Furnaces (1/40)	.80	2.00
Water Heating		
P-3—Electric Water Heater Installation Manual—Section I	.50	.50
O-4—Model Specifications for the Installation of Wiring and Plumbing for Automatic Electric Storage Water Heaters	.25	.25
F-8—Test Specifications, Automatic Electric Storage Water Heaters, EEI-NEMA	.20	.50

National Programs

Better Light—Better Sight Bureau		
"Light Is What You Make It"	5.00 per 100	
"Priceless Eyes"	4.50 per 100	
School Classroom Program for Teaching 5th and 6th Grade Students about light and sight	Price list upon request	
Commercial Cooking		
Sales Training Manual — Commercial Electric Cooking	1.50	1.50
The "Penny Folder" — "Invest One Cent in Electricity"	4.00 per 100	
O-7 — Commercial Electric Cooking and Baking Manual (9/46)	.75	1.85
Commercial Cooking Survey, 1942	.25	.25
Electric Kitchen Program		
A new electric kitchen program complete with a 16 mm. sound movie in color, booklets, mailing folders, newspaper ads.	Price list upon request	
Electric Water Systems Council		
"Running Water—The Farm Necessity"	2.50 per 100	
Manual of Water Supply Equipment	.75	1.50
Home Service		
Folder—"Here's Your Career"	4.00 per 100	
R-4—Make Home Economics Your Profession (minimum lots 100)	5.00 per 100	
R-14—Patterns for Parties (Minimum Order 100)	$14.00 per 100	
Lighting Films		
"10 Charts For Use With Disney Film"	15.00	
"Light Is What You Make It"—A sound movie in technicolor, produced by Disney Productions, 16 mm., 10 minutes	Price Upon Request	
"Let There Be Light" (Street Lighting sound slide film, 15 minutes, 75 frames	25.00	
"See For Yourself" (Home Lighting) sound slide film, 15 minutes, 105 frames	30.00	
"Educating in a Truer Light" (School Lighting) Colored Sound Slide Film 22 Minutes, Over 100 Frames	50.00	
Planned Lighting Program		
Stores, Schools, Offices, Industrial Homes—(A group of promotional publications on above)	Price List Upon Request	
Sales Training Course		
Basic Sets of 8 Films and Records	Set $200.00	
Basic Sets of 8 Salesmen's Manuals	Set 5.00	
Residential Sets of 4 Films & Records.	Set 100.00	
Residential Sets of 4 Salesmen's Manuals	Set 2.50	
Commercial Sets of 4 Films & Records	Set 100.00	
Commercial Sets of 4 Salesmen's Manuals	Set 4.00	
Rural Sets of 2 Films & Records	Set 50.00	
Rural Sets of 2 Salesmen's Manuals	Set 1.00	
Industrial Sales Training Handbook	18.50	
Residential Lighting Film & Record	30.00	
Residential Lighting Salesmen's Manual	.75	
Water Heating		
Self-mailers to Dealers (minimum lots 100)	1.50 per 100	
Stuffers in sets of 6 pieces (minimum lots 1000)	15.00 per 1000 sets	
Wiring		
M-8—Handbook of Farmstead Wiring Design	.40	.40
M-7—Handbook of Residential Wiring Design	.25	.25
Wiring Films		
Commercial Re-wiring — lantern slides, with lectures	Set $25.00	
Home Wiring — lantern slides, with lectures	Set 25.00	
Extra Copies Text	$1.00 per Copy	

Miscellaneous, Reference Books, etc.

50-12—"I Want to Know About the Electric Industry"—1950 Edition	2 to 99 copies .25 each 100 to 1000 copies $12 per hundred 1000 to 9000 copies $90 per thousand 10,000 or more copies $80 per thousand	
50-11—"Eighth Semi-Annual Electric Power Survey" 1950	$.30 per copy	
50-8—Farm Electrical Equipment Handbook, 1950 (Transportation collect on quantity orders)	Single copies 2- 49 copies 50- 99 copies 100-999 copies 1000 or more	$2.25 2.10 2.00 1.90 1.75
50-6—Principles for Sound Water Resources Development, 1950	$21.00 per thousand 3.00 per hundred	
50-4—"Seventh Semi-Annual Electric Power Survey", 1950	$.30 per copy	
R-17—Specifications for Impregnated Paper-Insulated, Lead-Covered Cable, "Solid" Type (8th Edition) AEIC, 1949	1.00	1.00
R-15—Sixth Semi-Annual Electric Power Survey, 1949	.30	.30
R-12—Electrical Metermen's Handbook—6th Edition—1950	Single copy $3.30 members Single copy 4.90 non-members Quantity prices upon request	
Q-13—"Take a Look at the Outlook"	10c	
Q-11—Suggested Field Test Procedure for Determination of Co-efficient of Performance Factor of an Electric Heat Pump While Operating on Heating Cycle, 1948	.25	.25
Q-5—Specifications for Impregnated Paper-Insulated Lead Covered Cable, "Low Pressure, Gas-Filled" Type—AEIC 1948	Single copies 10 or more "	$1.00 .85
M-13—Specifications for Impregnated Paper-Insulated Lead Covered Cable, "Solid" Type, "Oil-Filled" Type	Single copies 10 or more "	$1.00 .85
Objective Type Rates, 1933-1936	.80	2.00
Ice and Wind Loading Tables for Overhead Line Conductors (Revision of Tables 85 to 96 of the Overhead System Reference Book) 1942	1-4 copies 5-49 "	10c 6c
Rate Book for 1949	20.00	30.00
Weekly, Monthly and Annual Statistics (Includes Annual Statistical Bulletin; Weekly Electric Power Output; Monthly Electrical Research Statistics)	2.00	2.00

Periodicals

Home Service Exchange (5 or 6 issues a year) Up to 5 copies to Home Service Directors, Member Companies		Free
EEI-Member Yearly Subscriptions.		.50
Non-Member Yearly Subscriptions.		.75
Commercial Sales Log (several issues per year)	Each issue priced individually	
Better Light—Better Sight News (6 issues yearly)	1.00	1.00
Edison Electric Institute Bulletin (Monthly)	2.00	2.00
Farm Electrification (a bi-monthly publication) Up to 10 copies	Free	
Over 10 copies	.75	1.00
Discount for orders of 25 or more paid subscriptions, if mailed in bulk to one address	25%	
Discount for orders of 25 or more paid subscriptions, if mailed to separate addresses	10%	

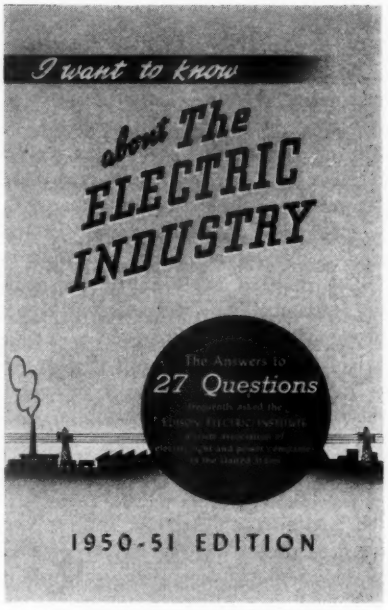
Electric Industry Progress, Preparedness, Covered in New Edition of EEI's Booklet, "I Want to Know About the Electric Industry"

A COMPREHENSIVE and straightforward view of the U. S. electric industry is presented in "I Want to Know About the Electric Industry," a booklet just published in its third annual edition by the Edison Electric Institute, at a time when accurate information on the nation's industries and resources is particularly vital.

Electric Industry in National Emergency

"What About the Electric Industry in a National Emergency?" is one of the 27 questions posed in the new booklet—and the answer, based on national figures from EEI statistical publications and from publications of the Federal Power Commission, gives in table and text the basis for electric industry confidence in its ability to supply enough power for whatever emergency the U. S. may face.

Relying on the same or equally authoritative sources, the answers to the other questions discuss in concise table-and-text style such important factors in electric industry strength as production and capacity, customers, power use in the home, agriculture and industry, as well as the industry's unparalleled expansion program and its financial position.



With a new cover, new typography and new material, the 1950-51 Edition of "I Want to Know About the Electric Industry" preserves the ready-reference form of the two preceding editions which attracted such favorable attention both within and outside the electric industry in 1948 and 1949.

Handy Reference Source

The booklet's value as a handy source for those interested in reading or writing about the electric industry has already been demonstrated; and copies of the previous editions have found wide circulation among electric company employees and others.

"I Want to Know About the Electric Industry" is even more significant as an informational aid at this time when the public may logically be expected to show a heightened interest in those industries on which the people's welfare and safety chiefly depend—a category in which the electric industry indisputably ranks among the most important.

Single copies may be obtained gratis by writing to the Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y. Prices for the booklet in quantity are as follows: 2 to 99 copies 25 cents each; 100 to 1000 copies, $12 per hundred; 1000 to 9000 copies, $90 per thousand; 10,000 or more copies, $80 per thousand.

RECENT EEI PUBLICATIONS

Eighth Semi-Annual Electric Power Survey —October, 1950

EEI Publ. No. 50-11. A report of the Electric Power Survey Committee of the Edison Electric Institute in cooperation with the Power Area Representatives of the Electric Power Systems and the Manufacturers of Heavy Electric Power Equipment. 24 pages. Price: 30 cents per copy.

The basic findings of the survey have been summarized as follows:

1. Capabilities of the power systems of the country for the years 1951 through 1953 will increase faster than shown by the previous semi-annual survey. For the country as a whole the increase for the period 1948 through 1953 is estimated at over 61 per cent.
2. Peak load estimates for the years 1950 through 1953 are substantially higher than those previously forecast as a result of increasing levels of business activity since the outbreak of the Korean War and plans for accelerated defense measures.
3. Reserve margins throughout the country are expected to be somewhat lower in December, 1950, than were estimated in the 7th Semi-Annual Survey. For the country as a whole the December, 1950, margin is expected to be 11.8 per cent. Under median hydro conditions, the December reserve margin for the country as a whole is estimated at 14.7 per cent for 1951; 17.9 per cent for 1952, and 19.9 per cent for 1953.
4. Manufacturing schedules for the production of heavy electric power equipment have reached new high levels. Orders for new electric generating capacity placed during the six-month period prior to October 1, 1950, for delivery during the period through 1953, total over 9,500,000 kw of which 8,600,000 kw is for continental U. S. utilities. The average capacity of new generating units on order has increased. On this basis, facilities for the manufacture of electric generating equipment are estimated as capable of producing 11,000,000 kw of capacity per year—8,800,000 thermal and 2,200,000 hydro. This is 10 per cent higher than previous estimates.

Specifications for Steel Bolts and Nuts

EEI Publ. No. TD-1, 1949. Specifications approved by the Transmission and Distribution Committee, EEI, to supersede NELA D-209-22, D235-22, D240-22, D243-22, D246-22, D250-22 and EEI TD-1, 1937. 7 pages. Price: 10 cents per copy.

These specifications cover carriage bolts, machine bolts, double-arming bolts, and nuts commonly used in overhead line construction.

PERSONALS

J. B. FRENCH, president and general manager, Black Hills Power and Light Co., Rapid City, S. Dakota, has been named to succeed W. N. CLARK, president, Southern Colorado Power Co., who has announced his retirement. At the same time it was announced that NEIL SIMPSON will become general manager of Black Hills Power and Light Co.

Mr. French has been engaged in the utility field since 1910. Prior to becoming head of the Black Hills Power and Light Co., he was for 12 years president and general manager of the Dakota Power Co., and has served in various capacities with other utility companies. Mr. French was president of the Rocky Mountain Electrical League during 1946-47.

C. B. LAWSON has been named vice president in charge of a new Schuylkill division of Pennsylvania Power & Light Co. as a result of consolidation of two more divisions in the anthracite-producing area.

He has been manager of the Pottsville division since 1934. M. J. MCDEVITT, manager of the former Schuylkill division, moves to the new Pottsville headquarters as manager of the consolidated Schuylkill division.

Mr. Lawson started his utility career as a student engineer with General Electric Co. in 1911. He joined PP&L 10 years later as district superintendent of Mahanoy City district. In 1924 he was made industrial engineer of the old Schuylkill division and two years later acting division manager.

Mr. McDevitt started in 1924 with the McAdoo electric light plant, an early PP&L predecessor. He later became district manager of McAdoo Electric Co., a Hardwood Electric Co. subsidiary acquired by PP&L in 1920. In 1929 he was made district manager of the Shenandoah district and five years later became division manager at Schuylkill.

W. H. RODGERS, JR., formerly advertising manager of the Pennsylvania Power & Light Company, has been appointed manager of the company's newly created advertising and publicity department and will report to J. M. Huebner, vice president of the company.

The work of the new advertising and publicity group includes greatly expanded responsibilities in the advertising and publicity field in the service of all departments in the company in these matters.

Mr. Rodgers joined the company originally as a summertime member of its test crew during his schooling at Bucknell University, becoming a regular member in June 1925. He then spent several years with the Bethlehem Steel Company and with a financial organization in New York City, returning to PP&L in 1930 as a member of its sales department. Three years later he was promoted to assistant manager of the advertising department and in 1940 to advertising manager, the position he held at the time of the present promotion.

WALTER T. LUCKING, assistant to the president of Arizona Edison Co., has been elected a vice president. He will be in charge of departments handling personnel, contract negotiations, rates, new business, safety, advertising, and publicity.

Mr. Lucking joined Arizona Edison on May 1st this year. He went there from Ohio Public Service Co. (now merged with Ohio Edison Co.), where he had been for eight years. His most recent assignment in Ohio was that of project manager in a $34 million construction program. Earlier he served Cities Service Co., parent of Ohio Public Service Co.

H. CECIL WEBB, vice-president, Puget Sound Power & Light Co., has accepted the position of general sales manager for the Oklahoma Natural Gas Co.

R. F. PLYMIRE has been promoted to the position of general commercial manager for Puget Power. He was formerly assistant to the executive vice president, L. E. Karrer.

Mr. Plymire, a University of Washington graduate with a B.S. degree in Engineering, joined Puget Power in 1930. He has served in various engineering and operating capacities including the local managerships of Bothell, Bellevue and Kirkland. He was manager of King County suburban area and assistant manager of the company's central division before being appointed to the position of assistant to the executive vice president.

BRIG. GEN. EPHRAIM F. JEFFE is retiring as a vice president of Consolidated Edison Co. of New York, Inc. He joined the former Brooklyn Edison Co. in 1916 as an assistant power engineer and in 1932 was named assistant to the vice president in charge of sales for New York Edison and United Electric Light & Power Co. He was elected a vice president of Consolidated Edison in 1936 and returned from World War II military service in 1945 as vice president in charge of sales.

EDWARD J. KELLEY, public relations director of Narragansett Electric Co., Providence, R. I., for the past six years, has been made a vice president.

Mr. Kelley, before joining Narragansett, was in newspaper work in New York and New England. He started with the Worcester (Mass.) *Telegram* as reporter and became night city editor. Later he worked for the Associated Press in Boston and New York and in 1933 received honorable mention in the Pulitzer Prize competition for crime reporting. In 1934 he became a reporter on the Providence *Journal* and served as managing editor of the Providence *Tribune* while it was under *Journal* ownership.

RALPH B. GRIERSON has been appointed rate engineer in charge of the rate division of The Detroit Edison Company. He will assume the duties of HARRY S. LOFQUIST, who has reached retirement age.

Mr. Grierson started with the company in 1937 as a student engineer in the construction engineering department. He was in the electrical system of the company for seven years and in 1947 was transferred to the rate division. He is a graduate of the School of Engineering, Yale University.

WILLIAM C. BRYSON has been appointed superintendent of system operation, Duquesne Light Co., succeeding C. L. RUPERT, who died November 9, 1950.

Mr. Bryson was graduated from University of Pittsburgh in 1924, with a bachelor of science degree in mechanical engineering. His first employment with Duquesne Light Co. was at Colfax Power Station as an instrument repairman, and later as assistant switchboard

operator. He left Duquesne Light Co. for a two-year period in 1926, and re-entered the service of the Company as a load dispatcher in the System Operation Department in 1928. Mr. Bryson received a number of promotions between then and April 1, 1950, when he was named assistant superintendent of system operation, which position he held at the time of this present appointment.

CHARLES L. DERRICK, superintendent of engineering for the Hartford Electric Light Co., has been named assistant to Vice President Fred D. Knight, who is in charge of the company's operating departments.

Mr. Derrick joined the company in 1942 as assistant engineer, later succeeding the late Frank S. Reynolds as head of the engineering department.

He is a 1923 electrical engineering graduate of Lehigh University. Prior to joining the Hartford company, he served for nineteen years in various engineering capacities with the Public Service Electric and Gas Co. of New Jersey. He is a member of the American Institute of Electrical Engineers.

L. P. BLOXAM, engineer with Carolina Power & Light Co. for the last five years, has been made superintendent of the Bennettsville, S. C., Electric and Water Plant. He succeeds W. H. PARKS, retiring after 29 years of service.

RAY L. STOUT, right-of-way engineer for Pacific Power & Light Co. for the past three years, will head property and right-of-way work for the new Greek national power network now under construction with Marshall Plan funds under the direction of Ebasco Services Inc. Mr. Stout has completed 40 years with PP&L and will take advantage of retirement rights to accept the new post. He worked for W. S. Barstow & Co. before joining PP&L.

ROGER J. COE, assistant chief engineer of New England Power Service Co., has been appointed executive director of the Committee on Ordnance of the Department of Defense's Research and Development Board. Mr. Coe was with General Electric Co. before joining New England Power Service in 1926.

FRANKLIN H. LICTHENWALTER has been named as managing director of the Pennsylvania Electric Association, GEORGE R. CONOVER, president of the Pennsylvania Electric Association and vice-president of the Philadelphia Electric Company, has announced.

Mr. Licthenwalter succeeds A. B. MILLAR, retired, who has been managing director of the P.E.A. since 1927, following service as secretary of the Pennsylvania Public Utility Commission and its predecessor, the Pennsylvania Railroad Commission.

The new managing director has been identified with government service since 1938, when he was elected to the Pennsylvania House of Representatives. In 1947 he was elected to the House of Representatives at Washington in a special election held that year. He was re-elected to the 81st Congress, in 1948, and was also a member of the Select Committee named to investigate the problems of small business. Mr. Licthenwalter did not run for re-election, and will retire from Congress at the end of his term this month, to devote his entire time to the service of the Pennsylvania Electric Association.

12th Annual Ebasco Safety Meeting Notes Growing Industry Interest in Safety

RECORD attendance at Ebasco Services Inc.'s twelfth Annual Safety Meeting, Chicago, Ill., Oct. 16-20, was credited to increased numbers of operating supervisors, executives and engineers, in addition to safety directors, joining delegations to the meeting from Ebasco client companies. Top executive interest in safety was reflected in the participation of T. C. Wescott, president, and H. H. Scaff, vice-president, Ebasco Services Inc., and C. T. Evans, vice-president, Arkansas Power & Light Co., who attended the meeting with 108 company representatives and their guests.

Emphasis on the necessity of conserving manpower and money in all-out defense preparations and the role of accident prevention as an important factor in this conservation program was the keynote of the meeting put forward by Mr. Scaff, who opened the sessions.

Part of the program was set aside for consideration of plant protection and defense measures of utility companies. Col. W. L. Furbershaw, vice-chairman of Chicago's Civil Defense Plant Protection Committee, delivered an address on the physical and psychological weapons of enemy agents and saboteurs and detailed the procedures and precautions necessary for protection against them. Citing American industrial strength as its major weapon in any international conflict, he warned that it is certain to be the enemy's prime objective.

Brief summaries of the steps taken by their companies to protect plant property and personnel in event of war were given by W. F. Brown, safety director, Consolidated Edison Co. of N. Y., Inc., and H. T. Jayne, safety engineer, The Philadelphia Gas Works Co.

Papers, panel and round table discussions, and a symposium on safety training featured such speakers and discussion leaders as E. S. Beaumont, director of safety, Peoples Gas Light and Coke Co.; C. A. Clift, division operations manager, Arkansas Power & Light Co.; W. E. Vance and T. R. Kelsh, safety lecturers, Consolidated Edison Co. of N. Y., Inc.; R. Ingram, foreman, Mississippi Power & Light Co.; G. Lewis, safety engineer, Portland Gas & Coke Co.; Fons Hughes, safety director, Pacific Power & Light Co.

Also W. T. Rogers, safety consultant, Ebasco Services Inc.; C. L. Hightower, safety director, United Gas Corp.; Dr. Walter Cutter, assistant director, Center for Safety Education, N. Y. University; C. K. Shelton, assistant division engineer, Texas Electric Service Co.; D. C. Stewart, safety supervisor, Niagara Mohawk Power Corp., and V. L. Womeldorff, safety director, Illinois Power Co., spoke to the delegates.

T. C. Wescott, who stressed the human consideration of accident prevention in his talk, announced final standings in Ebasco's 1949-50 Safety Award Program. Six companies, or their divisions, won awards for accident records 25 per cent or more below the national average for their type of operation. Winning companies included: New Orleans Public Service Inc., awarded a gold plaque for a record 78.6 per cent below the national average; and Mississippi Power & Light Co., awarded a silver plaque, whose record was 63.18 per cent below. United Gas Corp., West Tennessee Gas Co., Columbus Transit Co., and the Electric and Gas Departments of New Orleans Public Service Inc. will be awarded achievement certificates in ceremonies this month.

CONVENTIONS AND MEETINGS

1950

DECEMBER

13 EEI Industrial Relations Committee, 420 Lexington Ave., New York, N. Y.

1951

JANUARY

11 EEI Residential Lighting Committee, Nela Park, Cleveland, Ohio.

12 BL-BS Home Lighting Education Committee, Nela Park, Cleveland, Ohio.

12 PIP Mid-Atlantic Regional Meeting, Hotel Hershey, Hershey, Pa.

15-16 EEI Accident Prevention Committee, Lord Baltimore Hotel, Baltimore, Md.

15-16 EEI Commercial Cooking Committee, Washington, D. C.

15-17 Canadian Electrical Association, Engineering and Operating Division, Eastern Zone, General Brock Hotel, Niagara Falls, Ontario.

18 EEI Industrial Relations Committee, Detroit, Mich.

18-19 EEI Dealer Coordination Committee, Edgewater Beach Hotel, Chicago, Ill.

22-23 EEI Industrial Power & Heating Section, Hollenden Hotel, Cleveland, Ohio.

22-26 American Institute of Electrical Engineers, Annual Meeting, New York, N. Y.

24-25 Southern and Southwestern Electric Utilities Rural & Urban Development Conference, Roosevelt Hotel, New Orleans, La.

29-30 Canadian Electrical Association, Sales Division, Eastern Zone, Windsor Hotel, Montreal, Que.

FEBRUARY

1-2 Pennsylvania Electric Association, Transmission and Distribution Committee, William Penn Hotel, Pittsburgh, Pa.

8-9 Missouri Valley Electric Association, Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo.

12-13 EEI Electrical Equipment Committee, Hotel Cleveland, Cleveland, Ohio.

14 PIP Mid-Atlantic Regional Meeting—*meeting place to be announced.*

15-16 EEI Transmission and Distribution Committee, Atlanta Biltmore Hotel, Atlanta, Ga.

15-16 Seventh Annual Adequate Wiring Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio.

19-21 Canadian Electrical Association, General Division, Eastern Zone, Seigniory Club, Que.

21-24 American Society of Civil Engineers, Spring Convention, Houston, Tex.

MARCH

12-15 NEMA Annual Meeting, Edgewater Beach Hotel, Chicago, Ill.

21-22—EEI Industrial Relations Committee, Joint with Personnel Practice Committee, AGA, and New England Utility Personnel Association, Boston, Mass.

29-30 Oklahoma Utilities Association, Annual Convention, Mayo Hotel, Tulsa, Okla.

APRIL

2-5 17th Annual EEI Sales Conference, Edgewater Beach Hotel, Chicago, Ill.

APRIL—Cont.

2-5 ASME Spring Meeting, Atlanta Biltmore Hotel, Atlanta, Ga.

4-6 Missouri Valley Electric Association, Engineering Conference, President Hotel, Kansas City, Mo.

17-19 ASME, Process Industries Division Conference, Lord Baltimore Hotel, Baltimore, Md.

18-20 EEI Purchasing and Stores Committee Conference, Hotel Cleveland, Cleveland, Ohio.

19 EEI Industrial Relations Committee, 420 Lexington Ave., New York, N. Y.

23-25 1951 Conference of Electric and Gas Utility Accountants, Hotel Sherman, Chicago, Ill.

25-27 Northwest Electric Light & Power Association, Engineering Section, Hotel Utah, Salt Lake City, Utah.

MAY

7-9 Missouri Association of Public Utilities, Annual Convention, Jefferson Hotel, St. Louis, Mo.

7-9 Northwest Electric Light & Power Association, Business Development Section, Multnomah Hotel, Portland, Ore.

9 Commercial Electric Cooking Conference, Chicago, Ill.

16-18 Northwest Electric Light & Power Association, Personnel Section, Davenport Hotel, Spokane, Wash.

17-18 Missouri Valley Electric Association, Accounting Conference, President Hotel, Kansas City, Mo.

21-23 Pacific Coast Electrical Association, Annual Convention, Biltmore Hotel, Los Angeles, Calif.

28-29 EEI Electrical Equipment Committee, Hotel Biltmore, Los Angeles, Calif.

JUNE

4-7 Edison Electric Institute, Nineteenth Annual Convention, Denver, Colo.

11-15 ASME Semi-Annual Meeting, Royal York Hotel, Toronto, Can.

13-16 ASCE Summer Meeting, Louisville, Ky.

18-20 Canadian Electrical Association, Annual Convention, Algonquin Hotel, St. Andrews, New Brunswick.

25-29 ASME Oil and Gas Power Division Conference, Baker Hotel, Dallas, Tex.

SEPTEMBER

9-12 Rocky Mountain Electrical League Fall Convention, La Fonda Hotel, Santa Fe, N. M.

10-14 Joint ASME Industrial Instruments & Regulators Division, and Instrument Society of America, Exhibit and Conference, Houston, Texas.

20-21 PIP Second Annual Workshop Conference, Edgewater Beach Hotel, Chicago, Ill.

24-26 ASME Petroleum Mechanical Engineering Conference, Hotel Mayo, Tulsa, Okla.

25-28 ASME Fall Meeting, Hotel Radisson, Minneapolis, Minn.

OCTOBER

9-10 National Farm Electrification Conference, Gibson Hotel, Cincinnati, Ohio.

11-12 ASME Fuels—AIME Coal Conference, Roanoke, Va.

22-25 ASCE New York Convention, New York, N. Y.

NOVEMBER

12-15 NEMA, Haddon Hall, Atlantic City, N. J.

25-30 ASME Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

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(Terms Expiring 1952)

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(Continued)

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